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S/Sgt. A. J. Frankenberg
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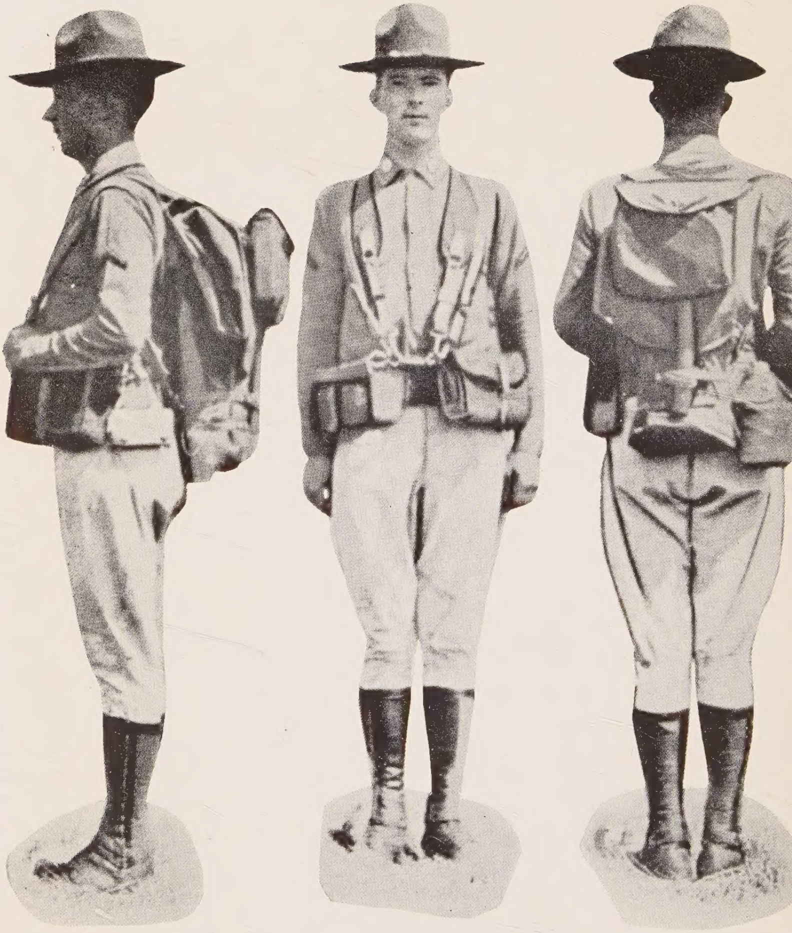

A Medical Soldier Equipped for Field Service; showing how the Infantry Pack is carried with the Private's Medical Kit, New Pattern.

HANDBOOK
FOR
THE MEDICAL SOLDIER

OF THE

REGULAR ARMY, NATIONAL GUARD, ORGANIZED RESERVES,
AND ENLISTED RESERVE CORPS
OF THE
ARMY OF THE UNITED STATES
AND
OTHERS INTERESTED IN NATIONAL MEDICO-
MILITARY PREPAREDNESS

By
ARNOLD DWIGHT TUTTLE
MAJOR, MEDICAL CORPS, U. S. ARMY

APPROVED BY THE SURGEON GENERAL OF THE ARMY

BALTIMORE
WILLIAM WOOD AND COMPANY
MDCCCCXL

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1941

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Reprinted August, 1928
Reprinted July, 1935
Reprinted March, 1938
Reprinted June, 1939
Reprinted March, 1940
Reprinted June, 1940

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Dedicated
to the Memory of
Oscar C. Tugo

The medical soldier who was elected by
Fate to be the first enlisted man of
the United States Army killed in
the World War

On September 4, 1917, at Dannes-Camiers, France, while
serving as a private first class of the Medical Department,
Base Hospital No. 5, U. S. Army (functioning
as General Hospital No. 11, of the British
Expeditionary Force), he fell at his post of
duty and met death at the hands of
the enemy, from a bomb dropped
during an air raid.

"The deaths ye died I have watched beside
And the lives ye led were mine"

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FOREWORD

The Author's extensive service, broad experience, and general knowledge have peculiarly fitted him to compile a work of this character. He has lived and knows the life of the enlisted men for whom he is writing. He never overlooks an opportunity to champion their cause, to promote their contentment, and to improve their prospects.

The medical soldier should find a special incentive in a brief review of Major Tuttle's military career. His record of service is unique. He has held all grades from private to colonel in the Medical Department. He participated in the Spanish-American War, the Philippine Insurrection, and the China Relief Expedition as a private, acting hospital steward, and hospital steward of the Hospital Corps, U. S. Army. In the World War he reached the grade of colonel, Medical Corps, U. S. Army, and served nearly two years at General Headquarters, American Expeditionary Forces; being a member of the General Staff at the time of the Armistice. In that capacity he assisted in supervising hospitalization and evacuation in the Combat Zone. Earlier, as a member of the Chief Surgeon's staff, he designed the type hospitals and planned the lay-out of the hospital centers constructed by the A. E. F. in France. He holds the degree of M.D., University of Maryland, is an honor graduate of the Army Medical School, and a Fellow of the American College of Surgeons. In recognition of his World War service he was awarded the Distinguished Service Medal (U. S.), the Legion of Honor (France), the Order of Leopold (Belgium), and appointed to the Initial General Staff Corps Eligible List.

During his long tour of duty in the Office of The Surgeon General since the World War he has been a leader in moulding and developing the organization of the Medical Department as we find it today; particularly as reflected in current Tables of Organization, Army Regulations, Training Regulations, and Statutory Laws. In view of the many and pressing official matters which daily come his way, his initiative and resourcefulness in turning out this Handbook under rather trying conditions are worthy of more than passing comment.

This book is a most illuminating, comprehensive, and up to date presentation of the basic knowledge we desire our enlisted men to possess. I heartily recommend its use by all medical soldiers, by their instructors, and by all others interested in medico-military preparedness.

So far as this Office is concerned, questions used in the competitive examinations to be held from time to time for appointment as non-commissioned officer in the Medical Service of the Regular Army will be based upon the material and references contained in this Handbook.

M. W. IRELAND,
Major General, The Surgeon General.

MWI—RK
Washington, December 1, 1927.

PREFACE

Soon after the establishment of the Hospital Corps of the Army, in 1887, it was appreciated that the instruction and training of its enlisted men were of paramount importance to the future efficiency of the Medical Department. The libraries of most of our military hospitals of that period were provided with books covering all that should be known, but this knowledge was so diffused throughout the pages of different volumes that it was difficult to find, and even when brought to light, was generally so far obscured by technicalities as to be beyond the understanding of enlisted men who had had no previous training along those lines. What seemed to be wanting was a single volume which would bring together the various subjects in which enlisted men of the Medical Department were most interested, and to present them in an intelligible manner.

This need was first met in 1889 by the publication of Smart's *Handbook for the Hospital Corps.* This Handbook proved an immediate success, and its study fitted for promotion many of the enlisted men who were ambitiously inclined. It passed through various editions, but eventually became practically obsolete and was succeeded by Mason's *Handbook for the Sanitary Troops,* which has since been utilized for the instruction of the Medical Department soldier.

It has again become necessary to bring this handbook of instruction up to date, and the author is attempting to fill the current need by this, his first edition, of what he hopes will popularly become known as "The Medical Soldier."

The title *Handbook for the Medical Soldier* has been adopted primarily to differentiate and exclude the veterinary soldier, also a member of the Medical Department, whose duties, especially from a technical standpoint, are not described herein and will probably have to be covered by the eventual preparation of a similar work, appropriately in a green instead of a maroon binding, under the title of "Handbook for the Veterinary Soldier". It also seemed, on second thought, that *Medical Soldier* was a much more dignified military title, paralleling as it does the terms "infantry soldier", "cavalry soldier", etc., so frequently though informally used in the Army.

The author of a work of this general character can lay but little claim to originality. In the main, it can reflect only a conscientious effort on his part to abstract and compile from various authoritative sources certain basic material which will be of value and stimulate study. This he has freely done.

The Medical Department of today, as well as the Army as a whole, has become so highly specialized that it is plainly impossible to include under one cover all the knowledge our enlisted men must acquire to assure proficient performance of their multifarious duties. Accordingly, in the following pages, the author has endeavored to present a concise, practical, and systematic discussion of only such themes as are essential to the majority. In so doing, he has had to resist repeatedly a tendency to include certain technical specialties likely to be followed by but few of our enlisted men. The needs of such men have been specially met by other publications which the Medical Department makes available for purposes of instruction and training.

While the principal concern of the author has been to make this Handbook sufficiently comprehensive, up to date, and of limited size, without saying too much on any one subject or attempting to cover too broad a field, it will be noted that he has included in it more information concerning general preparedness than has hitherto been the case.

In the peacetime pursuits of the Medical Department, never should we lose sight of the fact that our real mission is to prepare for national defense. Therefore, our enlisted men, as well as our officers, should have a broad conception of what this preparation for war involves. If all men were well informed on the history and the general organization and functions of their branch, our transition from a peace to a war status would be materially simplified.

The studies of medical soldiers should fit them to act intelligently in all matters relating to the management of a hospital or other Medical Department formation or establishment and the care of the sick and wounded. Each medical officer in command of a unit supervises the basic instruction of his men and the higher education of his noncommissioned officers, who, in turn, guide those who serve under them. The efficient performance of his routine duties will soon lead every studious man to the position of a noncommissioned officer; but besides this, it serves a higher end by preparing for the sudden expansion that must take place in time of war. When every noncommissioned officer is qualified to undertake the duties of the next higher grade, and every private is qualified for the position of a noncommissioned officer, the expansion of a unit can be effected merely by recruiting for the lowest grade.

Furthermore, it must be remembered that, in time of war, many of our noncommissioned officers, some of them temporarily in a commissioned grade, will occupy so-called "key" positions in our larger administrative offices. These men should now be taught the meaning of medico-military preparedness in its relation to the organization and mobilization of our manpower and industries for war; what it means, what it contemplates, what it involves. If the author has seemingly aimed a little too high in dealing with such topics, he expects that instructors by the aid of charts, black-board diagrams, and simple discussions, will always carefully appraise the level of the intelligence with which they are dealing and so adjust sights as to keep on the target.

It is believed that the fundamental knowledge presented herein will be of assistance to enlisted men in their self-study for promotion, and to instructors in conducting classes for them. On the other hand, this Handbook is not recommended as a substitute for the larger and more comprehensive technical treatises, Army Regulations, Training Regulations, and other military publications now in existence and governing our daily activities.

If it serves as a foundation to which further knowledge may be added through careful observation or by reference to other more extensive sources; if it becomes a factor in improving the character of service rendered in our medical formations and establishments; if it proves as helpful to enlisted men of the Medical Department in pointing the way to promotion as did Smart's Handbook of long ago in his own case, the object of the author will have been fully realized.

A D Tuttle

ADT—LS
Washington, December 1, 1927.

A. D. TUTTLE,
Major, Medical Corps.

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CHAPTER I

THE COUNTRY

Introduction. At the time of his enlistment every soldier takes the following *oath* or *affirmation:*

> "I, ———, do solemnly swear (or affirm) that I will bear true faith and allegiance to the United States of America; that I will serve them honestly and faithfully against all their enemies whomsoever; and that I will obey the orders of the President of the United States and the orders of the officers appointed over me, according to the Rules and Articles of War."

In keeping with the above solemn obligation regarding National Defense, and as a basis for faithful and loyal service, every soldier should know at least:

How to speak, write, and read simple English with understanding.

His duties as a soldier and citizen.

Enough of the long struggle for liberty to understand its meaning and to appreciate its value.

Enough of the sacrifices and achievements of America to inspire loyalty to the country and to the service.

Enough about human relationship to inspire his disposition to act honestly, industriously, reliably, cooperatively, and thriftily.

Enough about current national and international problems to enable him to act intelligently in the discharge of his duties.

Enough about the mechanism of the American Government to understand his place and responsibilities in it.

Birth. *The United States of America* joined the family of nations by virtue of the Declaration of Independence, adopted on July 4, 1776. *The Declaration of Independence* reads in part as follows:

> When, in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.
>
> We hold these truths to be self evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.

That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness.

Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed.

But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.

Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government.

The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world. * * * * (Here the Colonists recited a long list of the grievances and abuses to which they were being subjected by the mother country—England).

* * * * * * * *

WE THEREFORE, the Representatives of the United States of America, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by authority of the good People of these Colonies, solemnly Publish and Declare, That these United Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do.

And for the support of this Declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our Lives, our Fortunes, and our sacred Honor.

Growth. Thirteen States originally comprised the United States. In 1790 they covered an area of about 892,000 square miles, but at present cover about only one-third of that area, inasmuch as other states have been carved from the original boundaries of the thirteen.

The United States today, the oldest republic, is *bounded* on the north by Canada, on the east by the Atlantic Ocean, on the south by the Gulf of Mexico and Mexico, and on the west by the Pacific Ocean.

It *comprises* forty-eight states and the federal *District of Columbia.* For convenience this is called the continental United States.

In outlying areas are *Alaska, Hawaii, Porto Rico,* the *Philippine Islands, Virgin Islands, American Samoa, Guam, Wake,* other scattered islands in the Pacific, and the *Panama Canal Zone*—all aggregating about 716,000 square miles of *area,* which added to the three million and odd square miles of continental United States give a total of 3,742,903 square miles of territory over which flies the American flag.

The *population* of the continental United States is approximately 118,000,000 and of the outlying areas 12,000,000, making an aggregate of 130,000,000 people living under the protection of the United States Government.

The *climate* of the United States is of every gradation from the north temperate with rather cold winters and pleasant summers, to the subtropical.

In *natural resources* the United States is one of the richest countries in the world. Its coal, oil, timber, and precious metals exist in vast natural stores.

The agricultural interests of the country are unsurpassed.

Europe is the largest customer of the United States, buying one-half of the exports and sending in about one-third of the imports.

Financially, the national wealth of the United States is a source of envy to all nations.

Fig. 1. The Great Seal of the U. S. Adopted June 20, 1782.

Government. We are governed by the *Constitution of the United States,* which originally consisted of a Preamble and VII Articles and in that form was ratified by convention of the States September 17, 1787. The Government under the Constitution was declared in effect on the first Wednesday in March, 1789.

Certain parts of the Constitution of special interest to members of the military service follow:

> *Preamble.*—We, the people of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this *Constitution* for the United States of America.
>
> All legislative powers herein granted shall be vested in a Congress of the United States which shall consist of a *Senate* and *House of Representatives.*

All bills for raising revenue shall originate in the House of Representatives but the Senate may propose or concur with amendments, as on other bills.

The *Congress* shall have power: To lay and collect taxes, duties, imposts, and excises, to pay the debts and to provide for the common defense and general welfare of the United States. To declare war. To raise and support armies. To provide and maintain a Navy. To make rules for the government and regulation of the land and naval forces. To provide for calling forth the Militia to execute the laws of the Union, suppress insurrections and repel invasions. To provide for organizing, arming and disciplining the Militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers and the authority of training the Militia according to the discipline prescribed by Congress. To make all laws which shall be necessary and proper for carrying into execution the foregoing powers and all other powers vested by this Constitution in the Government of the United States or in any department or officer thereof.

The Executive power shall be vested in a *President of the United States of America.* The President shall be Commander-in-Chief of the Army and Navy of the United States and of the Militia of the several states when called into actual service of the United States.

The judicial power of the United States shall be vested in one *Supreme Court* and in such inferior courts as the Congress may from time to time ordain and establish.

Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort.

The United States shall guarantee to every State in this Union a Republican form of government, and shall *protect* each of them against invasion, and, on application of the Legislature, or of the Executive, (when the Legislature cannot be convened), against domestic violence.

Since its adoption in original form the Constitution has been changed from time to time by the addition of 19 Amendments.

Of special interest are:

Congress shall make no law respecting an establishment of *religion* or prohibiting the free exercise thereof; or abridging the freedom of speech or of the press; or the right of the people peaceably to assemble and to petition the Government for a redress of grievances.

No *soldier* shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war but in a manner to be prescribed by law.

Neither *slavery* nor involuntary servitude, except as punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

> The right of the citizens of the United States to *vote* shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.
>
> The manufacture, sale, or transportation of *intoxicating liquor* within, the importation thereof into, or the exportation thereof from the United States, and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.

Under the Constitution our form of government may be graphically shown as follows:

- **The Government of the United States**
  - Legislative Branch—**The Congress**
    - **The Senate.** 96 Senators. 2 from each state. Presiding Officer—The Vice President of the United States.
    - **The House of Representatives.** 435 Representatives. 2 Territorial Delegates. 3 Resident Commissioners. Presiding Officer—The Speaker.
  - Executive Branch—**The President**
    - **Department of State**
    - **Treasury Department**
    - **War Department**
    - **Department of Justice**
    - **Post Office Department**
    - **Navy Department**
    - **Department of the Interior**
    - **Department of Agriculture**
    - **Department of Commerce**
    - **Department of Labor**
    - Various establishments independent of the ten executive departments above listed.
  - Judicial Branch—**The Courts**
    - **The Supreme Court.** The Chief Justice of the United States and 8 associate justices.
    - **U. S. Circuit Court of Appeals.** 9 Circuits.
    - **United States District Courts.** 80 in all states.
    - Various Special Courts, such as **Court of Claims of the United States,** etc.

Flag. The flag is a symbol of the integrity of a nation. Since the oldest time it has been used to represent the character of its people. It is an interpretation of national aims and ideals.

Thus in the days of old the cross on the flag of the *Crusaders* represented the Christianity for which they were striving. The lion on the flags of *Richard the Lion Hearted* represented a bravery unsurpassed. The teaching of these ideas, particularly to children, soon give the flag a value to the people and a firm belief in the nation. The people themselves thus attain a character, symbolized by the flag, reflecting the great faith, bravery and belief in the correctness of the greatness of the things for which the flag stands.

The national flag represents a living country and is considered as a living thing.

Four different names for the flag of the United States, also known as the Stars and Stripes, are in use in the military service, viz: *Flag, color, standard,* and *ensign.* In general, the word "flag" is applicable regardless of the size, relative proportions, or manner of display, but the other three terms have certain well-defined usages of long standing. The color is a flag carried by foot troops and other unmounted units. The standard is a flag carried by mounted or motorized units. The ensign is a flag carried by ships, tenders, launches, and small boats. The staff on which a color is carried is known as a pike. The staff for a standard is called a lance.

The *United States Flag* has thirteen horizontal stripes, seven red and six white, the red and white stripes alternating, and a canton or union which consists of white stars of five points on a blue field, placed in the upper corner next to the staff and extending to the lower edge of the fourth red stripe from the top. The number of stars is the same as the number of states in the union. The canton now contains forty-eight stars arranged in six horizontal and eight vertical rows, each star with one point upward. The thirteen stripes represent each of the original colonies.

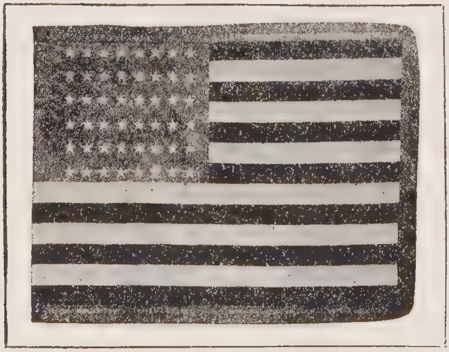


Fig. 2. National Standard Carried by a Medical Regiment and All Other Organizations.

The red stripes signify a willingness to undergo hardship, strife, and battle for its honor; its white stripes a purity of purpose in all things; its blue field covered with stars, opportunity as wide as the heavens; and the stars, independence of all other nations. Bound together into one whole, it represents strength of purpose, of right, and of character. These qualities are shown in the character of our people, in our belief in justice to all, equality of opportunity, and independence of thought and utterance.

The character of truth is exemplified by the kind of diplomacy used by our people, never underhanded, but ever open and above board, as shown by the frank statements concerning our aims in all wars, starting with the Revolution and ending with the World War.

Finally, our flag stands for all that is most dear to us in the life of our nation,—a part of the world's humanity.

National disrespect towards a country's flag invariably invites war.

Anthem. Despite the fact that Congress has never legally recognized a National Anthem, "*The Star Spangled Banner,*" written by Francis Scott Key during the bombardment of Ft. McHenry, Baltimore, Maryland, by the British Fleet during the war of 1812, is honored as such by the Army and Navy, as well as by the people at large and foreign governments, always with appropriate ceremony. It has been singled out for this national distinction to the exclusion of "America" and other patriotic airs.

Wars. The United States has engaged in the following foreign wars: Against Great Britain 1775–1783 (*The Revolution*); against Great Britain 1812–1814 (*The War of 1812*); against Mexico 1847–1848 (*The Mexican War*); against Spain 1898 (*The Spanish-American War*); and against Germany 1917–1918 (*The World War*).

To preserve the Federal Union, the Government had to resort to arms in a conflict between the States officially known as *The Civil War,* 1861–1865.

In establishing law and order and protecting settlers during the first one hundred years of our existence as a nation, it became necessary for the Army to conduct frequent campaigns against hostile Indians (*Indian Campaigns*).

In 1899–1902 the United States had to suppress the *Philippine Insurrection.*

In 1900 it participated with other nations in restoring order in China (*The China Relief Expedition*).

American's Creed. "I believe in the United States of America as a Government of the people, by the people, for the people; whose just powers are derived from the consent of the governed; a democracy in a republic; a sovereign Nation of many sovereign States; a perfect union, one and inseparable; established upon those principles of freedom, equality, justice and humanity for which American patriots sacrificed their lives and fortunes.

"I therefore believe it is my duty to my country to love it; to support its Constitution; to obey its laws; to respect its flag, and to defend it against all enemies."

(Written by William Tyler Page, Clerk of the U. S. House of Representatives in 1917, and adopted and promulgated by the Government's Committee on Publication. Accepted by the House of Representatives, on behalf of the American People, April 3, 1918.)

CHAPTER II

THE ARMY

Introduction. Congress determines the strength and character of the peace and war establishments and the classes of citizens, their number, and requisite qualifications, available for military service.

In passing the *National Defense Act of 1916* and as amended since that time, particularly by the *Act of June 4, 1920,* Congress specifically laid down the basis for the organization of the land forces of the United States.

Composition. It prescribed * * * That the Army of the United States shall consist of the Regular Army, the National Guard while in the service of the United States, and the Organized Reserves, including the Officers Reserve Corps and the Enlisted Reserve Corps. * * *

That the organized peace establishment, including the Regular Army, the National Guard and the Organized Reserves shall include all of those divisions and other military organizations necessary to form the basis for a complete and immediate mobilization for the national defense in the event of a national emergency declared by Congress. * * *

That for purposes of administration, training and tactical control the continental area of the United States shall be divided on a basis of military population into corps areas. * * *

That the War Department General Staff shall prepare plans for national defense and the use of the military forces for that purpose, both separately and in conjunction with the naval forces, and for the mobilization of the manhood of the nation and its material resources in an emergency.

General Administration. The War Department (Fig. 3) at Washington is presided over by a cabinet official, known as *The Secretary of War,* who is responsible to the President for the entire conduct of the military establishment. *The President,* it must be remembered, is also the Commander-in-Chief of the Army.

There is also an *Assistant Secretary of War* whose principal function is to study and determine how the supplies to be needed by the Army in time of war are to be obtained, and an *Assistant Secretary of War* who handles all matters dealing with aviation.

The principal adviser of the Secretary of War in the operations of the military establishment is *The Chief of Staff.*

Corps Areas and Departments. For purposes of military administration and control the continental United States is sub-divided into nine corps areas, viz.: 1st to 9th inclusive, and the following oversea forces—the *Hawaiian Department,* the *Philippine Department,* the *Panama Canal De-*

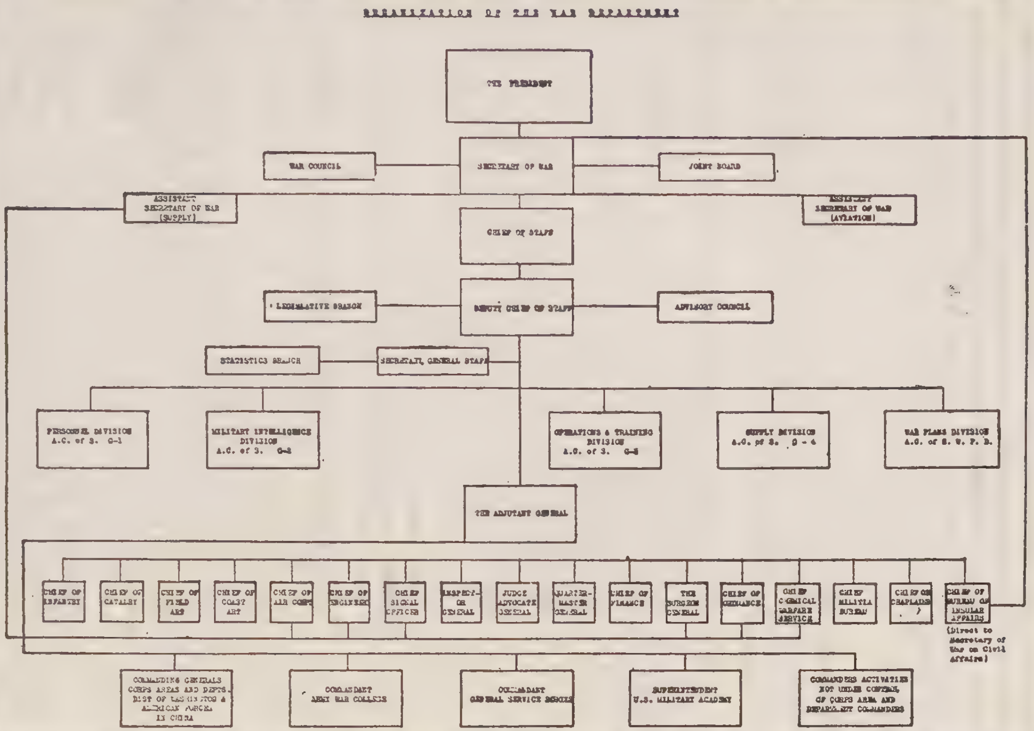

ORGANIZATION OF THE WAR DEPARTMENT
THE PRESIDENT
SECRETARY OF WAR
WAR COUNCIL
JOINT BOARD
ASSISTANT SECRETARY OF WAR (SUPPLY)
ASSISTANT SECRETARY OF WAR (AVIATION)
CHIEF OF STAFF
DEPUTY CHIEF OF STAFF
LEGISLATIVE BRANCH
ADVISORY COUNCIL
STATISTICS BRANCH
SECRETARY, GENERAL STAFF
PERSONNEL DIVISION A.C. of S. G-1
MILITARY INTELLIGENCE DIVISION A.C. of S. G-2
OPERATIONS & TRAINING DIVISION A.C. of S. G-3
SUPPLY DIVISION A.C. of S. G-4
WAR PLANS DIVISION A.C. of S. W. P. D.
THE ADJUTANT GENERAL
CHIEF OF INFANTRY
CHIEF OF CAVALRY
CHIEF OF FIELD ART
CHIEF OF COAST ART
CHIEF OF AIR CORPS
CHIEF OF ENGINEERS
CHIEF SIGNAL OFFICER
INSPECTOR GENERAL
JUDGE ADVOCATE GENERAL
QUARTERMASTER GENERAL
CHIEF OF FINANCE
THE SURGEON GENERAL
CHIEF OF ORDNANCE
CHIEF CHEMICAL WARFARE SERVICE
CHIEF MILITIA BUREAU
CHIEF OF CHAPLAINS
CHIEF OF BUREAU OF INSULAR AFFAIRS
(Direct to Secretary of War on Civil Affairs)
COMMANDING GENERALS CORPS AREAS AND DEPTS. DIST OF WASHINGTON & AMERICAN FORCES IN CHINA
COMMANDANT ARMY WAR COLLEGE
COMMANDANT GENERAL SERVICE SCHOOLS
SUPERINTENDENT U.S. MILITARY ACADEMY
COMMANDERS ACTIVITIES NOT UNDER CONTROL OF CORPS AREA AND DEPARTMENT COMMANDERS

Fig. 3. Organization of the War Department.

partment, and the *U. S. Army Forces in China.* The activities of these corps areas and departments, each under the control of a commanding general, with an adequate staff, are directed and coordinated by the War Department General Staff at Washington in accordance with policies adopted by that body from time to time, and approved by the Secretary of War.

(In time of war the above administrative and geographical organization would be continued in force, with the addition of certain *Theaters of Operation.*)

Mission. For the defense of the nation our military forces are now grouped, as above provided, into one coordinate body, known as the *Army of the United States,* consisting of three components. The mission of these components is as follows:

The Regular Army. To provide adequate garrisons in peace and war for our oversea possessions.

To provide adequate peace garrisons for the coast defense within the continental limits of the United States.

To provide personnel for the development and training of the National Guard and the Organized Reserves.

To provide the necessary personnel for the overhead of the Army of the United States, wherein the duties are of a continuing nature.

To provide an adequate, organized, balanced, and effective expeditionary force, which will be available for emergencies, within the continental limits of the United States or elsewhere, and which will serve as a model for the organization, discipline, and training of the National Guard and the Organized Reserves.

The Regular Army is the first component of the Army of the United States in peace and in war.

The National Guard. In time of peace, to provide an adequate, organized, and effective force, which will be available in minor emergencies for employment within the limits of the United States, by the States or by the United States.

In time of war or major emergencies, when Congress has authorized the use of troops in excess of those of the Regular Army, to provide an adequate, balanced, and effective component of the Army of the United States for employment by the United States without restriction.

The National Guard is the second component of the Army of the United States in peace and in war.

The Organized Reserves. To provide a trained, organized, and balanced force which may be readily expanded and developed into an adequate war component of the Army of the United States to meet any major emergency requiring the use of troops in excess of those of the Regular Army and the National Guard.

The Organized Reserves are the third component of the Army of the United States.

(The Regular Army and the National Guard may be employed separately or together in minor and in major emergencies, but the Organized Reserves constitute purely a war force and can be employed only in the event of a national emergency declared by Congress.)

Regular Army. The Regular Army constitutes the *permanent military force* and its current peace strength, limited by Congress annually in appropriation bills, is such as is deemed necessary to carry out its functions.

At present (1927) it is composed of 12,000 officers and about 118,000 enlisted men; although the National Defense Act contemplates that in time of war the Regular Army shall furnish a force of 18,000 officers and 280,000 enlisted men.

It provides the administrative organization for the entire military establishment.

As now constituted the Regular Army consists of: The Infantry, the Cavalry, the Field Artillery, the Coast Artillery Corps, the Air Corps, the Corps of Engineers, the Signal Corps, the General Staff Corps, the Adjutant General's Department, the Inspector General's Department, the Judge Advocate General's Department, the Quartermaster Corps, the Finance Department, *the Medical Department,* the Ordnance Department, the Chemical Warfare Service, the officers of the Bureau of Insular Affairs, the officers and enlisted men under the jurisdiction of the Militia Bureau, the chaplains, the professors and cadets of the United States Military Academy, detached officers, detached enlisted men, unassigned recruits, officers and enlisted men of the retired list, and a few Indian Scouts.

National Guard. The National Guard consists of the regularly *enlisted militia.* (The militia of the United States consists of all able-bodied male citizens between the ages of 18 and 45 years.)

The National Guard is organized, armed, and equipped like the Regular Army.

The governor of the state is the commander-in-chief of the National Guard of his state. The state adjutant general is the representative of the governor.

The National Guard is not in the United States service until specifically called or drafted for such service.

Under the law the United States Government authorizes camps and the expenditure of federal funds for National Guard purposes, but the responsibility for training rests with the National Guard.

Coordination of the affairs of the National Guard of the several states and the relations of the National Guard with the federal government are effected by the *Militia Bureau of the War Department,* the chief of which is a National Guard officer detailed for four years.

Officers and non-commissioned officers of the Regular Army are detailed for duty with the National Guard as instructors and inspectors.

The regulations governing the National Guard are known as National

Guard Regulations and are issued by the War Department in pamphlet form, similar to Army Regulations.

The National Guard may be employed as state troops under state authority, or by the federal government under a call to duty for the purpose of executing the laws of the Union, suppressing insurrection, and repelling invasion. In addition, members of the National Guard may be drafted into the Army of the United States, in which event they stand discharged from the National Guard, become members of the Army of the United States, and available for employment for all purposes in or without the territorial limits of the Union.

The National Guard is organized under the provisions of the *National Defense Act*. Its maximum authorized strength is approximately 400,000. Its present strength (1927) is about 180,000, including 12,000 officers.

Federal recognition of National Guard units is accorded under the law when they reach a state of development along the lines of the Regular Army, and such efficiency as guarantees their usefulness as a federal force in time of emergency, after which they are entitled to the federal benefits provided by law. This recognition is granted only when units maintain a certain minimum strength.

For the up-keep of the National Guard both the state and the federal government appropriate funds, the former largely for armories and state administration and the latter chiefly for training and drill purposes.

Medical detachments, medical squadrons and *medical regiments* are the only Medical Department units maintained in the National Guard organization.

M.D. Enrollment. The present (1927) enrollment of Medical Department personnel in the National Guard is 902 medical officers, 200 dental officers, 156 veterinary officers, 109 Medical Administrative Corps officers, and 10,187 enlisted men; an aggregate of 11,554.

Organized Reserves. The third component of the Army of the United States is made up of *citizens* engaged in normal peacetime pursuits, who join the *Officers Reserve Corps* or the *Enlisted Reserve Corps* and hold themselves in readiness for military service in the event of a national emergency. These citizen soldiers are assigned to reserve units patterned after the organization of those of the Regular Army.

The War Department designates the number of units to be assigned to the Organized Reserves and how, when, and where they are to be formed and called to active duty if needed.

For purposes of mobilization and training reserve units are administered under the direction of corps area commanders.

At present (1927) the enrollment of personnel in reserve units consists almost exclusively of officers, there being only a nucleus of non-commissioned officers and enlisted specialists. The Officers Reserve Corps is composed of sections corresponding to branches of the Regular Army and such additional sections as the President may direct.

There are approximately 106,000 reserve officers now (1927) on the rolls. To prepare themselves for military service and keep abreast of the times these officers devote a considerable part of their private time to study, to correspondence courses conducted by the Regular Army, and at intervals take brief courses of practical training at camps during the summer months.

Practically all types of *Medical Department units* are allocated to the Organized Reserves. The majority of hospital units are obtained from that source.

Command and Staff. Command is the authority which an individual in the military service lawfully exercises over subordinates by virtue of rank or assignment.

Commanders are provided with a staff of assistants whose function it is to elaborate the details necessary to carry his decisions into effect. With all units larger than a brigade there is a *general staff,* and a *technical, supply, and administrative staff.*

The technical, supply, and administrative staff includes representatives of the various branches who may be assigned to a headquarters for the purpose of advising the commander on all matters relating to his own branch. For example, a medical officer whose official title is *"The Surgeon,"* acts in that capacity for the Medical Department.

General Staff. *The General Staff Corps* provides officers for the War Department General Staff, and the General Staff with troops. The War Department General Staff (Fig. 3) consists of the Chief of Staff, a deputy chief of staff, and five assistant chiefs of staff, each in charge of a division commonly designated as *G-1, G-2, G-3, G-4,* and the *War Plans Division.*

Excepting a War Plans Division, the General Staff with troops is similarly organized. The Chief of Staff, under the President and Secretary of War, exercises general administrative authority over the entire military establishment, and presides over the War Department General Staff.

The principal function of each division of the General Staff is to supervise activities falling under the following major headings: G-1, *personnel;* G-2, *military intelligence;* G-3, *operations and training;* G-4, *supply.* (The War Plans Division includes all these activities in its studies of special war plans, and provides the nucleus of a General Staff organization for any field force raised.)

Branches. At Washington, as part of the War Department, each branch of the Army, including the combatant arms and the chaplains, is represented and supervised by a *Chief* with an official title such as The Chief of Infantry, The Chief Signal Officer, The Adjutant General, The Inspector General, The Judge Advocate General, The Quartermaster General, *The Surgeon General,* etc.

Chiefs of branches are staff officers and act as advisers to the War Department General Staff on all matters relating to their own branch.

The Adjutant General's Department, as a branch of the Army, keeps the records, publishes the orders, and conducts the correspondence of the military establishment.

The Inspector General's Department inspects, investigates, and observes every branch of the service as regards general efficiency, checks up on the condition and sufficiency of supplies of all kinds, and passes upon the general conduct and discipline of all troops.

The Judge Advocate General's Department is the legal branch of the army. It handles records of trials by courts-martial, courts of inquiry, etc. It renders legal opinions when called upon by proper authority.

The Quartermaster Corps procures, stores, and issues all supplies of standard manufacture common to two or more branches of the Army. It has many other miscellaneous functions, such as construction and repair of buildings, the operation of utilities, and providing the means of transportation for the Army.

The Finance Department is the disbursing agency of the War Department. In addition to handling money accounts it also audits property records. It disburses the pay of military personnel, at the rates established in the Act of June 10, 1922.

The Medical Department is described in Chapter III.

The Ordnance Department furnishes weapons, ammunition, etc., for the Army.

The Chemical Warfare Service is charged with the investigation, development, and production or procurement of all kinds of chemical warfare material and gas defense appliances, and of conducting researches with a view to overcoming the effects of such chemical warfare agencies as might be used by an enemy.

The Militia Bureau, the Chief of which is a National Guard officer, supervises the affairs of the National Guard.

The Bureau of Insular Affairs has charge of all matters pertaining to civil government in the island possessions of the United States, subject to the jurisdiction of the War Department.

Combatant Arms. The combatant arms, also known as the *Line of the Army,* are the infantry, the artillery, the cavalry, the signal corps, the corps of engineers, and the air corps.

The Infantry, often referred to as the "backbone" of the army, closes with the enemy and enforces the decision of battle. Its principal weapon is the rifle and bayonet. It is also equipped with automatic weapons, light cannon, and tanks.

The Artillery engages in long range combat. It does not get into direct contact with the enemy. It is the principal support of infantry. It directs its fire upon targets hindering the advance of infantry. It has guns of light, medium, and heavy calibre. Light artillery has guns of 3 inches and Howitzers of 4 inches in calibre. Medium artillery embraces guns from 4.7 to 5 inches and Howitzers of approximately 6 inches in calibre. Heavy artillery has guns, Howitzers and mortars of a calibre of 6 inches or more. Light artillery is assigned to infantry and cavalry divisions, medium artillery to corps, and heavy artillery to G. H. Q. Reserve. Anti-aircraft artillery units are assigned to corps and higher commands.

The Cavalry is characterized chiefly by its high degree of mobility. Moving quickly from one point to another it can concentrate fire power where most needed. Cavalry is armed with the rifle, machine rifle, pistol and sabre.

The Signal Corps provides organizations of experts skilled in the installation and operation of the technical means of signal communication. Telegraph and telephone lines constitute the principal means of transmitting messages. In addition, whenever practicable, a radio and carrier pigeon service are also operated.

The Engineers furnish organizations of skilled labor to keep avenues of travel passable to troops, construct defensive works when needed, and provide for the shelter and water supply of troops. In combat engineer units constitute an emergency infantry reserve. Engineer troops also turn out and furnish maps to the army, operate light railways and develop camouflage installations. In the communications zone they construct fixed hospitals for the Medical Department.

The Air Corps. Owing to the speed of airplanes, the air forces are able to cover great distances in a short period of time. The air forces have aviation pilot balloons, and airship units. Their missions comprise combat, observation, and the transmission of information. From high up in the air an aviator can observe troop movements, road and railway traffic, and other evidences of hostile activity on the part of the enemy and transmit information so gathered to commanders of our land troops below. Aviation is also a great aid in directing artillery fire. The Air Corps carries out bombing operations over enemy territory. It engages and destroys enemy airships. It installs captive balloons for the purpose of furnishing elevated observation posts.

Publications. The administration, training, and control of so huge an organization as the military establishment requires the use of certain standard publications. Only some of the most important need be mentioned.

Army Regulations. These embrace the administrative regulations for the military service, which are more or less of permanent application. They are published in pamphlet form, for file in a loose-leaf binder. The pamphlets bear a base number, indicating the general title, and a sub-number indicating the sub-title. The base number of the Medical Department is "40-".

Training Regulations embody all regulations covering the general subject of military training. They are issued in the same pamphlet form and with the same system of numerical designation, as are army regulations. The basic number of the Medical Department is "405-".

General Orders, Circulars, and Bulletins are issued from time to time by the War Department and lower commands. They usually deal with matters not having the permanent application of army regulations.

The Army Register is compiled and issued yearly by the War Department in compliance with law. It is an alphabetical register of the officers of the Army, with their record of service. It also contains a brief history of Regular Army units and pay tables of value for reference purposes.

The Army List and Directory is published every other month by the War Department. It gives the address of officers, and general data relating to the composition and location of the various components of the Army.

Tables of Organization prescribe the commissioned and enlisted personnel and the means of transportation allowed the various units and organizations of the Army. There are *"Peace"*and *"War"* strength tables, designated by the letters "P" or "W."

Education and Training. The War Department issues the regulations governing the training of the entire military establishment. It describes the general scheme of training, including the object, responsibility, and methods to be followed in attaining the desired proficiency.

Training matters are covered in a series of publications known as *training regulations, technical regulations, training manuals,* etc.

The object of all military training is preparedness for war. It involves the training of individuals and units.

In peace nearly all of the time of the Army is taken up with training, in order that all units to be utilized in time of war may take the field headed by officers well qualified to discharge the duties that will devolve upon them.

To further this training various military schools are in almost constant operation. These vary in type from the *unit schools* conducted for officers and enlisted men of each organization, to the *special* and *general service schools* maintained for the higher education of officers and certain selected enlisted men.

Almost every branch of the Army conducts one or more service schools. For example, for the Medical Department there are the Army Medical School, the Army Dental School, the Army Veterinary School, the Medical Field Service School, the School of Aviation Medicine, and the Army School of Nursing.

To train our officers in command and staff duties, there are the *Command and General Staff School* at Ft. Leavenworth, Kansas, and the

Army War College at Washington, D. C., to which officers of any branch may be assigned for purposes of instruction.

With the same latitude as regards attendance the *Army Industrial College* is also maintained at Washington for special instruction in the procurement of supplies on a major or war scale.

For the training of officers of the citizen components, particularly of the Reserve Corps, comprehensive *correspondence courses* are conducted at various periods throughout the year, to supplement the practical training they receive while in attendance at camps.

R. O. T. C. (The Reserve Officers Training Corps). Units are maintained at *civilian educational institutions* for the purpose of providing systematic military training and qualifying selected students for appointment as reserve officers.

R. O. T. C. units are found in nearly all of the large colleges and universities throughout the country. Over 100,000 students are enrolled in these units, the operation of which assures each year a steady flow of young officers to the Reserve Corps.

C. M. T. C. (Citizens Military Training Camps). Under War Department direction and with funds appropriated annually by Congress these C. M. T. C. are held during the summer months.

They are conducted primarily to train young citizens in the duties of the various grades from private to second lieutenant.

Roughly, the *courses of instruction* given at these camps are divided into four classes known as the *Basic, Red, White,* and *Blue.* The completion of the Red course qualifies the candidate for duty as a private, the White for duty as a non-commissioned officer, and the Blue for duty as a second lieutenant.

Mobilization. Mobilization for national defense is the operation of assembling and preparing the man-power and resources of the country to meet war conditions. It includes all arrangements necessary for raising fighting forces and sustaining national life. It involves both men and industries. It provides all the units needed by the Army and the supplies necessary for their maintenance.

All of these features are covered in mobilization plans and war plans prepared in time of peace. The War Department prepares a *general mobilization plan* which includes sufficient forces and activities to form a sound and ample basis for any war plan, even one involving a maximum effort on the part of the United States.

The general mobilization plan exhibits the entire composition of the Army in terms of units and lays down the time when a certain designated unit must be ready for mobilization. Based on the general mobilization plan, corps area commanders and branch chiefs draw up plans covering all essential details of the activities under their immediate jurisdiction.

Lastly, each unit of the Army prepares a *unit plan* specifically outlining all the steps necessary to be taken in getting the organization ready for service.

Mobilization is put into effect by orders initiated by the War Department. Such orders fall into two classes. *Warning orders* convey information relative to the situation and include such instructions as may be necessary. *Mobilization orders* are designed to make the plan operative in every respect. The mobilization order simply tells when mobilization will commence. *M-Day* is the date of the War Department order directing mobilization.

The mobilization of each unit involves 2 or 3 stages, depending upon circumstances. Where conditions in the vicinity of their home station are favorable as regards personnel, supply, etc. some units will be assembled locally (*local mobilization*).

Where proper facilities are lacking other units will be concentrated in selected areas for completion of the necessary requirements (*mobilization concentration*).

The final stage of mobilization involves the movement of each unit to a theatre of operations, or other place of active duty, and depends on the requirements of the specific war plan under consideration.

Definitions. The *rendezvous* or home station of the unit is the place at which the personnel thereof assembles upon the receipt of mobilization orders.

The *mobilization point* is the place where the unit completes its local mobilization.

A *mobilization camp* or *mobilization area* is the place to which units go from their home stations to complete the second stage of mobilization.

A *concentration area* is the locality, normally in the theater of operations, at which units are assembled preparatory to active operations.

Recruitment of personnel is effected either by voluntary enlistment or selective service. *Selective service* is that process whereby, under the law, the personnel for the military forces of the United States is selected from the civil population and inducted into the military service. It is commonly known as the *"draft."*

A reception center is an establishment organized for the reception, classification, and assignment of recruits from either voluntary enlistment or selective service that do not go direct to organizations. It includes the necessary organizations for developing defective recruits.

A limited service man is one who fails to meet the requirements for general military service but whose services may nevertheless be used advantageously by the Army. *A replacement* is a trained officer or enlisted man available for assignment.

A replacement center is an establishment at which individuals are trained as replacements. *A replacement depot* is an agency located in the theater of operations for the reception and distribution of replacements sent from the Zone of the Interior.

A supply point is a place from which all authorized supplies are issued to troops within a designated area.

Organization for War. Success in war can be achieved only by all branches and arms of the service mutually helping and supporting one another in the common effort to attain the desired end. No one arm wins battles. The combined employment of all arms and branches is essential to success.

For combat the field forces are organized into divisions, corps, armies, and a general headquarters, including a general headquarters reserve.

The infantry division is the basis of organization of the field forces. The cavalry division is normally the largest cavalry unit.

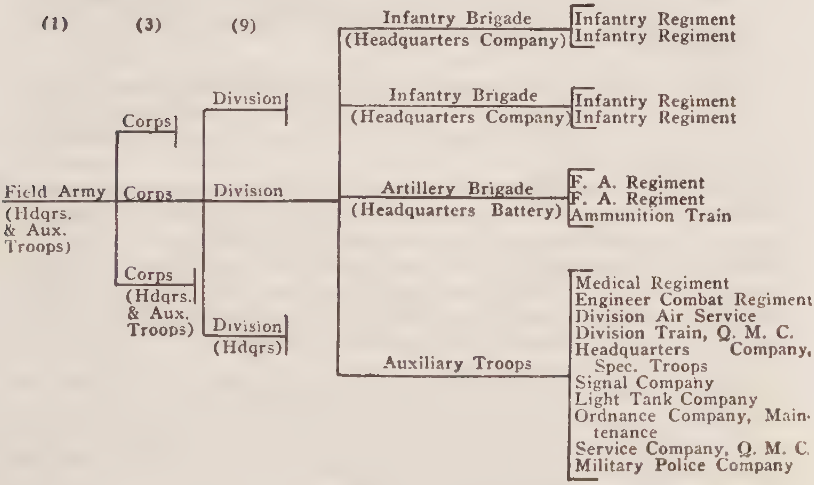


Fig. 4.—Composition of a Typical Field Army.

The *division* comprises in its organization the essential combatant and administrative branches, all in correct proportion and so organized as to make it a self-contained unit, capable of independent action.

The *corps* is composed of a headquarters, certain auxiliary troops and trains called corps troops, and two or more (normally 3) infantry divisions.

The *army* is composed of a headquarters, a body of auxiliary troops and trains called army troops, and two or more (normally 3) corps. In addition certain troops of the G. H. Q. Reserve are attached to an army from time to time as their special services are needed.

Two or more armies may be organized into a *group* of armies under a designated commander.

The headquarters of the commander of the field forces is the genera headquarters, generally referred to as *G. H. Q.* The *G. H. Q. Reserve* comprises certain troops which are not habitually required by an army, but are attached thereto by G. H. Q. as the occasion warrants.

In the event of a war requiring all of our resources in personnel and equipment, it is contemplated that the three components of the Army of the United States shall supply the following:

> **The Regular Army**—9 infantry divisions and 2 cavalry divisions, and certain corps, army, G. H. Q. Reserve, harbor defense, communications zone and zone of interior troops. In addition to the above the oversea garrisons and the general overhead for War Department and Zone of Interior activities are provided by the Regular Army.
>
> **The National Guard**—18 infantry divisions and 4 cavalry divisions, and certain corps, army, G. H. Q. Reserve, harbor defense and special troops.
>
> **The Organized Reserves**—27 infantry divisions and 6 cavalry divisions, and certain corps, army, G. H. Q. Reserve and harbor defense troops, and the major portion of the Communications Zone and Zone of Interior troops.

The details of organization for every unit of the army appears in what is known officially as its *table of organization.* For example, the organization of a hospital company at war strength is presribed in Table 85-W. The equipment authorized for each unit is also published in what is known as an *equipment table* which sets forth the quantities of individual equipment, such as clothing and kits, required by each man, and all the material needed by the unit as an organization, such as tentage, axes, field ranges, etc.

Areas of War. The *theater of war* comprises those areas of land and sea which are or may become directly involved in the war.

The *theater of operations* comprises the area of the theater of war in which operations are conducted. It is divided normally into a communications zone and a combat zone. (Fig. 10).

The *zone of the interior* in general comprises that area of the national territory not included in theaters of operations. The principal mission of the zone of the interior is to see that the commander in the theater of operations is furnished with all the men and material necessary to defeat the enemy.

The *combat zone* comprises the area of the theater of operations required for the active operations of the combatant forces. It is divided into *army, corps,* and *division areas.*

The *communications zone* is the part of the theater of operations containing the establishments of supply and evacuation, lines of communication, and other agencies required for the immediate support and maintenance of the entire forces in the theater of operations. It includes all the territory between the rear boundary of the theater of operations, and the combat zone. All of the *fixed hospitalization* provided by the Medical Department for a theater of operations is located in the communications zone.

Notes on Field Service. The art of giving proper instructions and orders to troops in the field is an important feature in the exercise of command. At the beginning of operations and from time to time thereafter the plans of the superior leaders are communicated in the form of *letters of instruction.*

Orders. *Field orders* regulate the use of troops. Field orders must be clear and definite. They follow a certain set form. In the body of the order, *paragraph 1* contains information concerning the enemy, *paragraph 2* the general plan of the commander, *paragraph 3* the disposition of the troops to carry out the plan outlined in paragraph 2, *paragraph 4* instructions regarding administration, traffic, supply, hospitalization, and evacuation. In divisions and higher units the administrative details are usually published in an *administrative order,* to which reference is made in the field order. All necessary details concerning the evacuation of men and animals appear in paragraph 4 of the field order, or in an administrative order to accompany same.

Messages. Each unit down to and including the battalion establishes and operates a *message center* which is charged with the dispatch, recording, coding and de-coding of messages.

When a message is to be sent, the message center determines what *means of transmission* will be used and is responsible for the prompt delivery, acknowledgement, and receipt of messages.

For the transmission of messages we have the telephone, telegraph, radio, airplanes, visual and sign signals, carrier pigeons, message grenades, etc. In addition, when these means of communication cannot be utilized, men furnished with such various means of transportation as motorcycles. bicycles, horses, or automobiles, or as a last resort, on foot, are required to carry messages. In the latter event the soldier is known as a *"runner"* (Rockets, flares, etc. are utilized by the infantry to signify the arrival of leading battalions at important points during a combat.)

Postal Service. Postal facilities for troops in the theater of operations are furnished by *military postal service* which is organized in time of war or emergency as a branch of the Adjutant General's Department. The military postal service handles the mail for all troops in the field.

Censorship. Censorship within the theater of operations is prescribed by the commander of the field forces as the situation may require. The main object of censorship is to prevent the *leakage of military information.* Censorship applies to private communications, photography, press dispatches, publications, and communications.

All private communications (postcards, telegrams, letters, etc.) of officers and soldiers and of all other individuals, such as newspaper correspondents, may be examined, and a censor is authorized to suppress any statement which might be of value to the enemy or prejudicial to the forces in the field.

Reconnaissance. Reconnaissance is the operation carried out by troops in the field for the purpose of *gaining information* relative to the enemy, or the terrain and resources of the theater of operations. Such information may be gained in the air by units of the air corps or on the ground by the cavalry, which is the principal agency for missions of this character. All local commanders make a reconnaisance in their immediate vicinity.

Security. A command protects itself against a surprise attack of hostile ground troops by reconaissance, by the employment of security detachments, and by the adoption of necessary measures to insure readiness for action of its component units.

When marching, for purposes of security it employs detachments known as *advance guards, rear guards,* and *flank guards* around the main body, and above, elements of the air corps, to protect against aerial attack.

When resting, the command throws out a covering detachment known as an *outpost,* to prevent the main body being surprised by the enemy.

Police. Military police are charged with enforcing all police regulations in the theater of operations. They *maintain order* throughout the areas to which they have been assigned, protect the inhabitants of the country and their property, enforce traffic control, supervise the travel of military personnel, apprehend deserters and absentees, and collect all stragglers and hand them over to their organizations.

To perform these important duties they are distributed throughout the theater of operations.

In case of emergency the military police may call upon any troops to assist them. All persons belonging to the military servcie are required to give every assistance to the military police in the execution of their duties.

Troop Movement. Troop movements are effected by marching, by motor transportation, by rail, and by water. Near the enemy, troop movements are generally executed by marching although, to concentrate troops at a special point, motor transportation may be employed.

Foot troops march 2¼ to 2½ miles per hour. Columns of the size of an infantry division average only about 12 miles a day.

Cavalry walks 3¾ miles an hour and trots 8 miles an hour. Depending upon conditions cavalry moves at the rate of 12 to 25 miles a day, as does also horse-drawn artillery.

When marching, all troops halt each hour for from 5 to 15 minutes.

Shelter. According to circumstances, troops in a theater of operations are sheltered in bivouac, camps, or billets.

Troops are in *bivouac* when resting on the ground covered only by shelter tents or hastily improvised shelter, or without any overhead cover.

Troops are *in camp* when sheltered by tentage other than shelter tents, or quartered in huts or other temporary structure especially constructed for military purposes.

Troops are in *billets* when occupying private homes or buildings not especially designed for military purposes.

Supply. For simplicity and convenience of administration, supplies required by troops in the field are divided into four classes as follows:

Class I.—Supplies which are consumed at a relatively uniform rate and which do not necessitate special adaptation to meet individual requirements—subsistence, forage, motor fuel and oils, and articles of a similar nature.

Class II.—Supplies which, though consumed at an approximately uniform rate, are for the personal use of the individual and require special arrangements to meet individual requirements—clothing, gas masks, and similar articles.

Class III.—Individual and organizational equipment prescribed by tables of organization and equipment.

Class IV.—Supplies and equipment for which allowances are not prescribed, articles of an exceptional nature, and supplies and equipment the distribution of which depends upon the conditions imposed by the operations—ammunition, fire-control apparatus, radio apparatus, air corps supplies, medical supplies, engineer construction material, etc.

These supplies are largely stored in the communications zone and forwarded to the troops at the front in quantities sufficient to meet their immediate needs. Fighting troops are never burdened with excess supplies, the accumulation of which would tend to decrease their mobility.

Storage points for supplies are known as *depots,* which sometimes indicate their relationship to the front by being designated as base, intermediate, or advance.

A *regulating station* is the point through which the movements of troops and supplies between the combat and communications zone are controlled.

A *railhead* is a point on the railroad at which supplies are discharged and at which they are transferred direct to field and combat trains, or from which they are forwarded to relay or refilling points.

A *refilling point* is the place at which the supplies are turned over to the supply officers of divisions, and of corps and army troops.

A *distributing point* is the place at which the supplies are directly distributed to the troops who are to use them.

A small limited reserve of supplies is maintained in the combat zone at places designated as *army depots, corps parks,* or *division dumps.*

CHAPTER III

THE MEDICAL DEPARTMENT

Introduction. Every medical soldier should possess a general knowledge of the organization and functions of his own department. While perhaps not essential to his immediate duties, a review of its history brings out many items of interest.

In this chapter is given but an outline of the general principles governing the Medical Department on a peacetime footing. In epitomized form there is discussed only the salient features of each topic. The standard regulations or other official documents should always be consulted for complete details.

History. Military medicine is as old as armies. Surgeons accompanied the armies of all the ancient civilizations. With the army of *Alexander the Great* were the best known medical practitioners from all parts of Greece.

In the Roman Armies the medical service was well developed, especially during the reign of *Augustus Caesar* (31 B. C.—14 A. D.). Surgeons were attached to each column and camp. Sick and wounded soldiers became objects of great solicitude, and during their period of convalescence were commonly visited in their tents by the emperors. The Roman soldier carried bandages which served as a first aid packet. Wagons are mentioned as having been in use as ambulances.

Many centuries later (1484) *Queen Isabella* of Spain first established field hospitals and ambulances on a large scale. Medical examination of recruits was inaugurated by France in 1726. About that time treatises on sanitary matters also began to appear.

In 1718 France established the first school for the training of medical officers. In a description of the *Battle of Fontenoy* (1745) we read that attached to the 60,000 French troops engaged were 40 surgeons with equipment to establish temporary hospitals on the battle field about 2,000 yards from the front line. After the battle the wounded were carried on caissons and carts to more permanent hospitals located about 20 miles away. "It is rare that surgical operations are performed on the field proper, that is, at the place where the wounds are inflicted and still more rare are amputations performed. The slightly wounded betake themselves to the hospital station; the dangerously wounded are carried there on litters."

Revolutionary Period. The history of the Medical Department of the U. S. Army begins with the outbreak of the American Revolution (1775) and particularly with the siege of Boston. The army formed at Cambridge after the battle of Lexington at best had but little semblance of organization. Among those gathered together were many physicians, none of whom held commissions nor did they have any means for establishing hospitals.

The *Massachusetts Congress,* then in session, early foresaw the necessity for caring for the sick and wounded and on the 8th of May, 1775, passed an act requiring that all physicians enrolled in the army pass an examination as to their professional fitness for service. During the early phase of the revolution all sick were treated in their regiments or companies. The need for hospitals was soon recognized and authorized.

Soon after taking command of the army, *General Washington* wrote a letter to the *Colonial Congress,* then in session in Philadelphia, reciting the deplorable conditions attending the care of the sick and wounded and recommending the establishment of a hospital service, with a director and necessary assistants.

On the 27th of July, 1775, Congress passed a bill which provided that for an army of 20,000 men, the following medical officers and other attendants be appointed: 1 *Director General and Chief Physician,* 4 surgeons, 1 apothecary, 20 surgeons mates, 1 clerk, 2 storekeepers, 1 nurse to every 10 sick, and such laborers as may be necessary. The bill went further and specified the duties of these appointees: The director general to furnish bedding, medicines and all other necessaries, to pay for the same, to superintend the whole and make his report to and receive orders from the commanding general. Surgeons, apothecary, and mates to visit the sick, and the mates to obey the orders of the physician, surgeons, and apothecary. A matron to superintend the nurses, bedding, etc. Nurses to attend the sick and obey the orders of the matron; clerks to keep accounts for the director and storekeepers. Storekeepers to receive and deliver bedding and the necessaries of the director.

This legislation practically witnessed the birth of the Medical Department as it exists today. Its evolution throughout the various periods of our national history has been attended by stagnation and at times almost complete annihilation, as a result of reductions made in the standing army after the termination of the various wars in which we have been engaged. In fact, it was not until after the lessons learned in the Civil War that our Medical Department was placed upon a sound footing.

Space will not permit a discussion of the many changes that have taken place in the organization, equipment, and functions of the Medical Department since the days of the Revolution. There are, however, certain milestones which may be pointed out in the way of progress down through our years of activitiy as a branch of the army. As regards the evolution of our organization, this is indicated chiefly by certain legislative enactments.

Following the demobilization of the Continental Army, after the close of the Revolution in 1783, we find a provision in law (1785 and 1790) for surgeons and surgeons mates to be attached to the various regiments maintained. In 1799 Congress specifically authorized a medical establishment to consist of a *physician general,* an apothecary general, a purveyor, hospital surgeons, hospital mates, stewards and nurses, and prescribed their duties. In 1802 we find a reference to the hospital matron first authorized during the Revolution. In 1808, 1 ward master to each hospital was authorized. In 1816 post surgeons are mentioned.

Permanent Status. The year 1818 saw the Medical Department placed on a permanent basis. A *Surgeon General* and an assistant Surgeon General were provided for. In 1821, "The Medical Department shall consist of 1 surgeon general, 8 surgeons, and 45 assistant surgeons." In 1856, the direct enlistment, or appointment from enlisted men of the army, of hospital stewards, not to exceed 1 for each military post, was specifically authorized. Soldiers acting as cooks and nurses in hospital were also allowed extra pay.

Civil War Period. During the Civil War, 1861–1865, many changes took place. In 1861, the enlistment of medical cadets for a period of 1 year was authorized, as well as the substitution in general and permanent hospitals of female nurses in place of soldiers.

In 1862, a medical inspector general of hospitals was created; also medical inspectors who were charged with the duty of inspecting the sanitary condition of transports, quarters, camps, and field and general hospitals, and of reporting all circumstances relating to the sanitary condition and wants of troops and of hospitals, and to the skill, efficiency, and good conduct of the officers and attendants connected with the Medical Department. Medical purveyors, charged with the selection and purchasing of all medical supplies, were also provided for.

In 1864, an act was passed to establish a uniform system of ambulances in the armies of the United States. This was legal recognition of the splendid system of field organization and evacuation developed by Medical Director *Jonathan Letterman* of the Army of the Potomac in 1862. Letterman's system of regimental medical service, division field hospitals, and an Ambulance Corps taken together made a complete workable organization which at once marked a new epoch in the annals of medical service in the field and save for some slight variations, is employed to this date by all modern armies. In addition the law prescribed how the Ambulance Corps should be organized and commanded, and specified that the officers and non-commissioned officers and privates of that corps be identified by a separate uniform. Acting assistant surgeons (contract surgeons) were first employed in large numbers during the Civil War period, although reference to civil physicians being employed on that status is found in the Army Regulations of 1817.

The period from 1865 to 1898, from the close of the Civil War to the outbreak of the Spanish American War, has been alluded to as the day of small things in the U. S. Army.

The Hospital Corps. To the Medical Department, however, this period witnessed a most important accomplishment, as by an act of Congress on

March 1, 1887 there was organized and developed a Hospital Corps consisting of men enlisted solely for duty in the Medical Department, to replace the system of detailed cooks, nurses, and civilian personnel. The Secretary of War was authorized to enlist men for or transfer them to the Hospital Corps and to fix the number. The Act provided that the Hospital Corps of the U. S. Army consist of hospital stewards, acting hospital stewards, and privates, and that such corps be permanently attached to the Medical Department.

The organization of a Hospital Corps marked a great stride forward in the efficient organization of the Medical Department and had a tremendous influence in the subsequent history of our operations. Prior to its creation the Medical Service on a peacetime footing consisted of a surgeon general in Washington, a medical director for each geographical department, and a post surgeon, with perhaps an assistant, and a hospital steward at each military post. The hospital was manned by a small enlisted detachment, detailed from the line companies on duty at the post. Such details were temporary in character and their duration usually depended upon the success of the surgeon in retaining the good will of the company commanders. Just about the time that a man became fairly proficient in caring for the sick he was relieved and replaced by an inexperienced man. The difficulties of administering a hospital and rendering efficient service under such conditions can well be imagined. All of this was changed by the adoption of the Hospital Corps. Not only did our enlisted men remain permanently with us, but we were able for the first time to train them exclusively in the duties peculiar to the Medical Department. Accordingly, this act of March 1, 1887, which gave birth to the Hospital Corps of the U. S. Army, is of special interest to all enlisted men of the Medical Department.

Spanish-American War Period. In 1901, following our experiences in the Spanish-American War and the Philippine Insurrection, the *Nurse Corps* was authorized. This act prescribed that the Nurse Corps (female) consist of a superintendent and as many chief nurses, nurses, and reserve nurses as might be needed.

Contract dental surgeons were authorized under the same conditions applicable to contract surgeons.

In 1904, the grades in the Hospital Corps were changed from hospital steward, acting hospital steward, and privates, to sergeants first class, sergeants, corporals, privates first class, and privates. The Secretary of War was also authorized to organize companies of instruction, ambulance companies, field hospitals and other detachments of the Hospital Corps as the necessities of the service might require.

Creation of a Medical Reserve. In 1908, there was passed an act to increase the efficiency of the Medical Department of the U. S. Army, of far reaching importance. This act provided that the Medical Department consist of a *Medical Corps* and a *Medical Reserve Corps,* Hospital Corps, Nurse Corps and dental surgeons. It placed medical officers in a new corps—the Medical Corps, and gave them definite rank in such corps from the grade of 1st lieutenant to colonel. Today, with the enormous enrollment in the Reserve Corps of the Army and the importance of the Organized Reserve component of the Army of the United States, the fact is sometimes lost sight of that the Medical Reserve Corps created in 1908 was practically the father of our present reserve system in this country. This act authorized the President to issue commissions in the Medical Reserve Corps to citizens of the United States who could be called to active duty with the army whenever their services were needed in an emergency.

In 1911, a *Dental Corps* was authorized as part of the Medical Department. In 1912, An act was passed to provide for the use of the *American National Red Cross* in aid of the land and naval forces in time of actual or threatened war. Under this act the President was authorized to accept assistance tendered by the Red Cross and to employ it in the medical services of the Army and Navy.

The National Defense Act. In 1916 came the National Defense Act. This act was passed in the days of the great war that had been raging abroad since 1914. The United States entered that war, now known as the World War, on April 6, 1917. In many particulars this act assured the United States a better system of preparedness for National Defense than it had ever enjoyed in the past. It went so far as to prescribe the organization of typical infantry and cavalry divisions, and included therein "1 sanitary train."

As regards the basic organization of the Medical Department it created and made part of the Medical Department a *Veterinary Corps,* consisting only of officers. It substituted a Medical Department enlisted force for the old Hospital Corps, transferring the members of the latter to the "Medical Department." To this enlisted force of the Medical Department it added additional titles and grades as follows: Master hospital sergeants, hospital sergeants, corporals, cooks, horseshoers, saddlers, farriers, and mechanics. It recognized specialists pay for dispensary assistants, nurses, surgical assistants, etc. It also created an Officers Reserve Corps for the Regular Army in which was to be absorbed the Medical Reserve Corps. It also authorized the establishment of Reserve Officers Training Corps units in civil institutions and recognized an Enlisted Reserve Corps.

In 1917, as regards rank, officers of the Dental Corps were placed on the same footing as medical officers. In 1917–1918 during our participation in the World War, a Sanitary Corps was organized under presidential authorization. In this corps were commissioned all officers needed by the Medical Department in carrying on its administrative, supply, and technical functions, who by reason of experience and training did not fall into and were not eligible for commission in such professional groups as the Medical Corps, Dental Corps, etc.

Army Reorganization Act. In 1920, as the result of our experience in the World War the National Defense Act of 1916 was amended by the Act of June 4, 1920. The passage of this act witnessed for the first time the adoption of a definite military policy for the United States. Save for minor amendments it is the act under which all of our efforts of preparedness for national defense are now being conducted.

Only some of the outstanding provisions of this act need be cited as of special interest to members of the Medical Department.

It classified all enlisted men into seven grades as follows: First grade (master sergeant), second grade (technical and first sergeant), third grade (staff sergeant), fourth grade (sergeant), fifth grade (corporal), sixth grade (private 1st class), and seventh grade (private). The titles of these grades, such as master sergeant, were adopted by the War Department and not specifically prescribed in the act. It provided that enlisted men of the sixth and seventh grades (privates 1st class and privates) may be rated as specialists and receive extra pay therefor on a graduated scale from first class to sixth class.

The Medical Department. Section 10 of the act covers the specific organization of the Medical Department. It provides for one Surgeon General with the rank of major general, two assistants with the rank of brigadier general, a Medical Corps, a Dental Corps, a Veterinary Corps, a Medical Administrative Corps, a Nurse Corps, such contract surgeons as may be required, and the enlisted force. To meet the needs of the Regular Army establiishment, it provided for officers of the *Medical Corps* at the rate of 6½ for every thousand, and of the *M. A. C.* one for every 2,000 of the total enlisted strength of the Regular Army, and of the *Dental Corps* at the rate of one for every 1,000 of the total strength of the Regular Army. The number of officers of the *Veterinary Corps* was fixed at 175. The *enlisted strength* of the Medical Department was fixed at 5 percent of the actual strength, commissioned and enlisted, of the Regular Army. It provided for the promotion of all officers of the Medical Department after a fixed number of years of service.

The Medical Administrative Corps created in this act embraces only the grades from second lieutenant to captain. In the M. A. C. were commissioned former enlisted men of the Medical Department who had served as officers of the Sanitary Corps during the World War. The M. A. C. is the avenue through which enlisted men of the Medical Department may directly gain a commission. (As regards the restriction in grade at present imposed on members of the M. A. C. and future prospects, see below, p. 30, the changes proposed in 1926 by the present Surgeon General.)

For the first time members of the Army Nurse Corps were given the relative rank of officers.

Provision was also made for the development of an Officers Reserve Corps on a large scale, sufficient to supply all the officers ever to be needed in any emergency. The bill carried a specific provision for the establishment of Reserve Officers Training Corps units in medical, dental, and veterinary schools.

Proposed Legislation. In 1926, to increase the efficiency of the Medical Department of the Regular Army on a peacetime footing, as well as to provide the organization which he deems essential for expansion in time of war, The Surgeon General recommended that Section 10 of the National Defense Act be further amended. This recommendation is now receiving the consideration of the General Staff but has not yet been submitted to Congress for action.

However, as the amendment substantially represents the present needs of the Medical Department and may receive congressional approval in whole or in part by the time this book comes off the press, it seems appropriate to state some of its salient features.

> The grade of brigadier general is proposed for the officer of the Dental Corps and of the Veterinary Corps heading those divisions in the Office of The Surgeon General.
>
> Enlisted men of the Veterinary Service are now of the "Medical Department." Under the terms of the proposed bill they would become sergeants, privates, etc. of the "Veterinary Corps."
>
> Members of the Nurse Corps would have relative rank on up to the grade of colonel.
>
> The present Medical Administrative Corps, and the Sanitary Corps which is utilized only in time of war, would be absorbed in a newly created *Medical Auxiliary Corps.* Enlisted men of the Medical Auxiliary Corps and of the Veterinary Corps would be eligible for commission in this new corps. Promotion in this Medical Auxiliary Corps, open to enlisted men, would extend through the grades of second lieutenant to colonel, after stated periods of commissioned service.

This brief sketch on the history of the Medical Department, as will be noted, deals largely with personnel matters involving legislation. No effort has been made to outline the organization of the Medical Department as determined and changed from time to time by the War Department itself, with the personnel, material, etc. specifically authorized by Congress.

Achievements. Likewise there has not been introduced herein the Medical Department's notable record of achievment. From the very beginning of our history as a nation the Medical Department of the U. S. Army has had great traditions in the line of professional attainments, of devoted service to the sick and wounded, and of gallantry in action. A century and a half have elapsed since the first humble beginning of the Army Medical Department at the Siege of Boston. The successors of the pioneers in American military medicine can say with pride that during that long period they have taken no step backward. Under the leadership of such wise and accomplished chiefs as those listed below, the Medical Department has steadily advanced from the hodge-podge conditions attending its birth to the comparative perfection in organization, discipline, training, and learning which it has attained today. During the Revolution we but copied the systems in vogue in European armies and ineffectually endeavored to adapt them to the partisan warfare which characterized the campaigns of that period. Today, as a result of the experience gained since then in the wars through which the United States has passed, the medical officers of foreign armies recognize their indebtedness to us for much that constitutes progress in military medicine, hygiene, surgery, and organization.

Our peacetime contributions to the health of mankind have also received world-wide recognition and acclaim. The conquest of Yellow Fever by Major *Walter Reed,* General *Gorgas* and their co-workers stands out as one of the most glorious achievements of recent years.

In the past history of the Medical Department, in the gradual increase of its reputation and usefulness, in the high esteem in which it has always been held by the rest of the army, in the distinguished names which have adorned its ranks, there is every encouragement to maintain a high standard of individual proficiency and to promote the *esprit de corps* which is so important an element of its very existence. By work well and faithfully done every enlisted man of the Medical Department has boundless opportunities to add to its prestige.

Chiefs of the Medical Department (1775–1927).

1775: Benjamin Church, Director General and Chief Physician of the Hospital of the Army.
1775–1777: John Morgan, Director General and Physician in Chief of the American Hospital.
1777–1781: William Shippen, Jr., Director General of the Military Hospitals of the Continental Army.
1781–1783: John Cochran, Director General of the Military Hospitals of the Continental Army.
1792–1796: Richard Allison, Surgeon to the Legion.
1798–1800: James Craik, Physician General.
1813–1814: James Tilton, Physician and Surgeon General.
1818–1836: Joseph Lovell, Surgeon General.
1836–1861: Thomas Lawson, Surgeon General.
1861–1862: Clement A. Finley, Surgeon General.
1862–1864: William A. Hammond, Surgeon General.
1864–1882: Joseph K. Barnes, Brigadier General, Surgeon General.
1882–1883: Charles H. Crane, Brigadier General, Surgeon General.
1883–1886: Robert Murray, Brigadier General, Surgeon General.
1886–1890: John Moore, Brigadier General, Surgeon General.
1890: Jedediah H. Baxter, Brigadier General, Surgeon General.
1890–1893: Charles Sutherland, Brigadier General, Surgeon General.
1893–1902: George M. Sternberg, Brigadier General, Surgeon General.
1902: William H. Forwood, Brigadier General, Surgeon General.
1902–1909: Robert M. O'Reilly, Brigadier General, Surgeon General.
1909–1913: George H. Torney, Brigadier General, Surgeon General.
1914–1918: William C. Gorgas, Brigadier General and Major General, Surgeon General.
1918– : Merritte W. Ireland, (incumbent) Major General, The Surgeon General.

Composition. As constituted under existing law the Medical Department consists of one Surgeon General, two Assistant Surgeon Generals, the Medical Corps, the Dental Corps, the Veterinary Corps, the Medical Administrative Corps, the Army Nurse Corps, contract surgeons, and enlisted men. (For salient details, see History.)

Mission. A Medical Department is provided for the army to preserve the strength of the military forces, by keeping men fit for duty. This it aims to accomplish by: 1. Selecting for service, through properly conducted physical examinations, only those men physically fit to perform the duties of a soldier. 2. Keeping such men in good physical condition through the enforcement of proper sanitary and preventive-medicine measures; and 3. Furnishing those who do become disabled, with such aid in the form of evacuation and hospitalization facilities as will quickly restore them to health and fighting efficiency.

Functions. In keeping with its mission the Medical Department is charged with the following routine duties and responsibilities:

To make physical examinations for admission to, and of members of, the army.

To preserve health and prevent disease among military personnel.

To provide proper care and treatment for the sick and wounded, with a view to restoring them to duty as soon as possible.

To so dispose of the sick and wounded as to insure the retention of effectives and relieve the fighting forces of the disabled.

To transport the sick and wounded.

To administer military hospitals, dispensaries, hospital trains, and other agencies necessary for the care, treatment, and transportation of sick and wounded.

To keep records pertaining to the activities of the Medical Department.

To select, classify, and train Medical Department personnel.

To operate a Veterinary Service for the Army, including the inspection of meats and dairy products required by the Army.

To procure, store, and issue certain supplies used by the Medical Department.

To conduct researches and experimentation connected with the development and improvement of Medical Department equipment.

To prepare and keep certain photographic and historical records pertaining to accomplishments of the Medical Department.

To conduct special training activities for members of the Medical Department.

To collect and publish vital statistics relating to the Army.

To plan in advance for the mobilization of all Medical Department personnel and equipment to be required in time of war.

General Organization and Administration. Medical Department affairs are supervised and coordinated broadly by 1. The Surgeon General at

Washington, 2. The Surgeon on the staff of each corps area and department commander; and 3. The Chief Surgeon of any theater of operations or of an expeditionary force. Locally, a Surgeon attached to each station or organization throughout the military establishment in turn shares this responsibility within his own circumscribed sphere of activity.

In time of peace most of the personnel of the Medical Department of the Regular Army are employed in making physical examinations, caring for the sick and injured of the military service, and providing the general administrative overhead. But a very small proportion is engaged on field training in preparation for war.

As regards field units, the Medical Department with the personnel allowed is able to maintain within the continental limits of the United States, only two medical regiments and one medical squadron, all at reduced strength. The 1st Medical Regiment (1st Division) is permanently stationed at the Medical Field Service School, Carlisle Barracks, Pa., the 2nd Medical Regiment (2nd Division) at Fort Sam Houston, Texas, and the 1st Medical Squadron (1st Cavalry Division) at Fort Bliss, Texas.

Overseas there are the 11th Medical Regiment at Honolulu, and the 12th Medical Regiment at Manila; also at reduced strength.

For medical attendance the requisite number of dispensaries and hospitals are maintained to meet only the peacetime needs of the Army. These units, as well as the schools and other activities of the Medical Department, are described below. In time of peace when a command of the Regular Army takes to the field for practice marches, maneuvers, or to meet a minor emergency the medical detachment to accompany the troops usually is obtained from the local hospital. To provide for minor expeditions plans have been perfected to organize, with regular army personnel, at large hospitals now in operation, certain medical regiments and other units, such as evacuation hospitals, station hospitals, etc.

A vast majority of the units to be needed by the Medical Department in time of war are provided for in our war plans and will come from the Organized Reserves. The National Guard will provide only its own divisional units.

Surgeon General. The Surgeon General, with the rank of major general, is appointed by the President, by and with the advice and consent of the Senate, for a four-year term. He is the adviser of the War Department upon all matters relating to the administration, organization, and general preparedness of the Medical Department, both in peace and war. He is directly responsible for the general efficiency of his department. Two of his principal assistants bear the title of assistant surgeon general, with the rank of brigadier general, Medical Department, and are similarly appointed. One is employed in his office as chief of the Planning and Training division, and the other commands the Army Medical Center at Washington.

To handle the many matters that come before him for consideration and action, the *Surgeon General's Office* is divided into ten divisions in peacetime, and twelve divisions in time of war. The peacetime organization has the following divisions:

Administrative. The administrative division includes an executive officer who has general supervision over all divisons of the office and immediate control over records and correspondence. The executive officer is also the custodian of the central hospital fund.

Dental. The dental division has administrative and technical supervision of the dental service of the Army.

Finance and Supply. The finance and supply division has administrative supervision over Medical Department finance, supply, construction and repair of hospitals, and procurement planning. Procurement, storage, and issue of Medical Department material is one of its important functions. In time of peace it is charged with certain inspection duties which in time of war would be taken over by a separate *"Inspection Division."*

Library. The library division supervises the purchasing, indexing, and cataloging of medical literature. It loans medical literature to libraries. hospitals, colleges, etc. (It occupies a separate building.)

Nursing. The nursing division has administrative supervision over the nursing service of the Army.

Personnel. The personnel division has charge of the procurement, classification, assignment, transfer, and examination of the commissioned, enlisted, and reserve Medical Department personnel.

Professional Service. The professional service division supervises and directs the professional service, hospitalization, and laboratories. It handles all matters relating to the physical examination of officers, nurses, and enlisted men. It exercises supervision over the Army Medical Museum. It also handles matters relating to preventive medicine. In time of war it will expand into two divisions: *"Hospitalization and Professional Service"* and *"Preventive Medicine."*

Vital Statistics. The vital statistics division receives, classifies, and corrects all reports of sick and wounded. It computes vital statistics of the Army and assembles and edits the Annual Report of The Surgeon General.

Planning and Training. The planning and training division supervises Medical Department organization, war planning and training activities. It assembles and edits tables of organization, equipment tables, Army Regulations, Training Regulations, and similar publications which affect the Medical Department.

Veterinary. The veterinary division has administrative and technical supervision of the veterinary service of the Army.

Medical Corps. The Medical Corps consists exclusively of commissioned officers in grades from first lieutenant to colonel, who are graduates in medicine. The authorized strength for the Regular Army (1927) is 981 medical officers.

The duties of a medical officer are threefold in character: *Professional*—duties incident to the practice of medicine, including physical examinations for the preservation and promotion of health; *Advisory*—duties pertaining to a medical officer as a staff officer; and *Administrative*—duties pertaining to a commander of Medical Department personnel and establishments, and the patients therein.

Normally there is a staff medical officer for each expeditionary force and for each command larger than a company. The senior medical officer present for duty with a command is in addition to his other duties the staff medical officer. The basic title of a staff medical officer is *"surgeon,"* which, as commonly used in the military service, indicates his staff or advisory position rather than his professional qualifications, and is analogous to such terms and positions as quartermaster, adjutant, etc. The duties of a staff medical officer are advisory in his relations as a staff officer and administrative in his conduct of the Medical Department as a technical service under the control of his commanding officer.

The surgeon supervises the Dental and Veterinary activities of the command, and in the absence of a veterinary officer is directly responsible for the Veterinary Service, including its administration.

Medical officers who have had special training and instruction at the School of Aviation Medicine are designed as *Flight Surgeons.* A flight surgeon is a specialist on the bodily problems of flying. He lives in close touch with the flying personnel at his station, examines them from time to time, and keeps his commanding officer advised as to their fitness for flying.

In divisions, corps, armies, at the headquarters of corps areas and departments, and at large stations a medical officer is detailed as *Medical Inspector.* Under The Surgeon General or the Chief Surgeon of a theatre of operations *general medical inspectors* are employed. These officers make periodic inspections to determine sanitary conditions, and the general efficiency of Medical Department formations and establishments.

The title of the senior medical officer assigned to a general headquarters or to any expeditionary force is *"Chief Surgeon."*

The senior medical officer of a hospital, dispensary, or other medical unit or detachment is officially addressed as *"Commanding Officer,"* e.g., "The Commanding Officer, General Dispensary, U. S. Army, Washington, D. C."

The senior medical officer assigned to the headquarters of any command not medical, except as above noted, is officially addressed as "Surgeon," e.g., "The Surgeon, First Army," but to facilitate rfeerence to these staff officers as groups or classes the use of the following titles is authorized:

Territorial divisions, tactical units, etc.	*Official title*	*Official address*
Corps area	Corps area surgeon	The Surgeon, Second Corps Area.
Territorial department	Department surgeon	The Surgeon, Hawaiian Department.
District of Washington	District surgeon	The Surgeon, District of Washington.
Post, camp, or station	Station surgeon	The Surgeon, Fort ——.
Port of embarkation or debarkation, of transport base	Port surgeon	The Surgeon, Port of ———, San Francisco, Calif.
Army transport	Transport surgeon	The Surgeon, U. S. A. T. ———.
Communications zone	Zone surgeon	The Surgeon, Communications Zone.
Army	Army surgeon	The Surgeon, First Army.
Corps	Corps surgeon	The Surgeon, II Corps.
Division	Division surgeon	The Surgeon, 5th Division.
Regiment (except medical regiment)	Regimental surgeon	The Surgeon, 28th Infantry.
Battalion	Battalion surgeon	The Surgeon, 1st Battalion, ——— Infantry.

Dental Corps. The Dental Corps consists exclusively of commissioned officers, in grades from first lieutenant to colonel, who are graduates in dental surgery. The authorized strength for the Regular Army (1927) is 158 dental officers. Members of the Dental Corps are assigned certain assistants from the enlisted force of the Medical Department, designated as *dental technicians.* These jointly conduct the dental service for the Army, which is strictly a professional activity.

When speaking broadly of the general organization of the Medical Department as being divided into a medical service (for man) and a veterinary service (for animals), the dental service naturally falls under the former category and is not listed separately.

Matters relating to the dental service as a whole are administered by The Surgeon General and subordinate surgeons with the advice and assistance of dental officers.

Specifically, the dental service is charged with the preservation of dento-oral health, and the prevention or treatment of dento-oral diseases among military personnel. Diseased teeth are a prolific source of many disabilities.

The basic title of the senior dental officer who serves as the administrative assistant to the surgeon of a command is *The Dental Surgeon;* e.g.

division dental surgeon, regimental dental surgeon, etc. Space in a hospital or dispensary assigned to the dental service is known as the *"dental clinic."*

Veterinary Corps. The Veterinary Corps consists exclusively of commissioned officers, in grades from second lieutenant to colonel, who are graduates in veterinary medicine. The authorized strength for the Regular Army (1927) is 126 veterinary officers. About ten percent of the enlisted force of the Medical Department are now engaged wholly on work connected with the operation of the Veterinary Service. It has been proposed (see history) that these men be enlisted directly in the Veterinary Corps.

The Veterinary Service deals with animals; the Medical Service with men. The Veterinary Service is charged with maintaining the health of all the animals of the Army, and inspecting and passing upon the suitability of food supplies of animal origin, and of forage. Its administrative and professional organization in the Medical Department is practically patterned after that prescribed for the Medical Service.

In addition to the duties and responsibilities devolving upon him as a practitioner of Veterinary Medicine the veterinary officer also has advisory and administrative functions to perform. When serving in the former capacity as a staff officer he bears the designation of *"The Veterinarian"*; e.g. Division Veterinarian, Corps Veterinarian, etc. Administratively, he commands detachments, hospitals, and other units pertaining to the Veterinary Service.

Medical soldiers should know something of the relationship they bear to their fellow-worker—the *veterinary soldier*. The dual nature of the functions of the Veterinary Service, concerning animals on one hand and human beings on the other, involves a close and definite relationship in the general service required of the Medical Department. The Veterinary Service with animals and the Medical Service with humans proceed along parallel lines. The problems of sanitation and preventive medicine, of the control of preventable diseases, of the professional care of the sick, and the administration of hospitals are precisely analogous, as are the procedures prescribed and the means provided for their solution. While appropriately united in one department and administered under one head—the Surgeon General—the Veterinary and Medical Services are, in a technical sense, separate except as they may occasionally meet on the common ground of an animal disease which might possibly be communicable to man. The Veterinary Service with humans, i.e., that phase concerned with the examination of food supplies, is entirely a matter of sanitation and is a direct extension of the medical service, which is charged with responsibility in all matters concerning the protection of the health of the troops.

Proper coordination of its activities as a branch can be assured only when there is but one representative of the Medical Department on the staff of the commanding officers. Since all considerations involving the health of personnel are paramount, such staff duty logically devolves upon the senior medical officer present with the command. This principle, however, is to be construed as placing the veterinary officer as a subordinate of, or assistant to, the surgeon only in a staff capacity. In his staff relations the veterinarian furnishes the surgeon with such technical information as may be necessary in properly representing the affairs of the Medical Department. In addition to their staff functions as surgeon and veterinarian, respectively, the medical officer commands the medical detachment and the veterinary officer commands the veterinary detachment, and in such command capacity each is directly responsible only to the local commanding officer. Accordingly, at posts, camps, and stations, the reports, returns, etc., relating exclusively to the veterinary detachment or to the technical operation of the Veterinary Service not involving the health of man are not transmitted by the veterinarian through the surgeon.

Medical Administrative Corps. The Medical Administrative Corps consists of commissioned officers, in grades from second lieutenant to captain, who are unable to qualify for appointment in any other commissioned grade in the Medical Department merely because of the lack of a requisite degree in medicine, dentistry, or veterinary medicine. The authorized strength (1927) for the Regular Army is 72 medical administrative officers.

Appointments in the Medical Administrative Corps are made from enlisted men of the Medical Department, between the ages of 21 and 32 years, who have had at least two years' service. The examination for these appointments is competitive, and educational and professional in scope. The educational examination is written and includes history, English grammar and composition, geography, and arithmetic. The professional examination is written, oral, and practical, and includes administrative regulations, office organization and administration, mess management, property accountability and responsibility, courts martial procedures, drill, the duties of a detachment commander, etc.

Officers of the M. A. C. are employed largely on duties connected with administration, supply, and messing. In fact they may be utilized in any capacity other than a strictly professional one connected with prescribing for and treating the sick and wounded. As regards the future of this corps, in which all ambitious enlisted men of the Medical Department should be interested, see History.

Contract Surgeons. These are civilian physicians employed in emergencies under contracts entered into by The Surgeon General, with the approval of the Secretary of War. They may be engaged for full-time or part-time service. Usually they are assigned to places not justifying the full-time employment of an officer of the Medical Corps. The professional and administrative duties of a contract surgeon are however the same as those of an officer of the Medical Corps. They are entitled to the same protection in their positions and to the same respect and obedience as are commissioned officers. While the term contract surgeon has been in use for many years, a more appropriate and modern title for personnel of this class would be *"contract physician."*

Sanitary Corps. This corps is not a part of the Regular Army in time of peace. It is a reserve and intended for utilization in time of war. It consists exclusively of commissioned officers, in grades from second lieutenant to colonel.

The duties of officers of the Sanitary Corps embrace special scientific matters allied to the duties of the Medical Department and essential to its efficient organization and operation in time of war. It is composed of officers qualified as sanitary engineers, hospital architects, Public Health licentiates who are not graduates in medicine, experts on food and nutrition, psychologists, chemists, laboratory and X-ray experts, and business and technical men engaged in the production of supplies and appliances used by the Medical Department. It has been proposed (see History) that the Sanitary Corps and Medical Administrative Corps be combined in one corps under the title of "Medical Auxiliary Corps," with commissioned grades from second lieutenant to colonel, and an enlisted section.

Nurse Corps. The Army Nurse Corps consists exclusively of women who are graduates of recognized schools of nursing. The allowance of nurses is fixed by the Secretary of War on the recommendation of The Surgeon General. Usually it is based upon the total bed capacity of our hospitals, one nurse being authorized for every ten patients. The grades and relative rank of nurses are: *Superintendent* (major), *assistant superintendents* (captain), *directors and assistant directors* (captain), *chief nurses* (1st lieutenant), and *nurses* (2nd lieutenant).

The superintendent and assistant superintendents serve in the nursing division of The Surgeon General's Office; the former exercising general supervision over the entire affairs of the Army Nurse Corps. Directors and assistant directors are wartime appointees and assigned only to a theater of operations. Chief nurses and nurses serve in hospitals, dispensaries, etc.

Nurses are entitled to the same obedience from enlisted men and patients in and about military hospitals as is accorded commissioned officers of grades corresponding to their relative rank. Although they are not eligible for details as members of courts martial they may prefer charges against any member of the military service under the same conditions as prescribed for commissioned officers.

When two or more chief nurses are serving at the same station one of them is assigned by her immediate commanding officer as *principal* chief nurse and the others as her assistants. A principal chief nurse has general supervision over the nursing service of the formation or establishment with which she is serving and has charge of the nurses' quarters. Her relations to the nurses under her supervision are analogous to those of a company commander to the personnel of his company. When necessary the principal chief nurse assigns a nurse to supervise the nursing service of the hospital at night. Ordinarily one nurse in each ward is designated to act as its responsible nursing head, under the title of *head nurse.* The head nurse is in charge of the ward, the nurses, the enlisted personnel, and other persons assisting in the nursing care of patients, and of the patients, under the direction of the ward officer and must be respected and obeyed accordingly. She receives from the ward officer all orders relating to the care and treatment of patients in the ward and records the orders for the guidance of both day nurses and night nurses. She is responsible for the proper nursing of the patients, the proper serving of all food in the ward, the administration of medicines and other treatment prescribed, the cleanliness and order of the ward, the safety of the effects of the patients until they have been turned over to the proper custodian, the prompt transmittal of prescriptions to the pharmacy, and the prompt delivery of the diet orders to the hospital office. As regards their conduct and efficiency the head nurse reports to the principal chief nurse when nurses are concerned, and to the ward officer in the case of enlisted men on duty in the ward.

In time of war or other emergency the Nurse Corps is increased by calling to active duty reserve nurses whose names appear upon the rolls of the American National Red Cross Nursing Service.

Enlisted Men. The current (1927) authorized strength of the enlisted force of the Medical Department of the Regular Army is as follows:

	Medical service (including dental)	Veterinary service	Total
Master sergeants	49	5	54
Technical sergeants ...	79	7	86
Staff sergeants	423	43	466
Sergeants	542	55	597
Corporals	276	29	305
Privates, first class	1554	160	1714
Privates	2989	309	3298
			6520

They are officially designated as of the "Medical Department," e. g. Sergeant John Smith, Med. Dept. It has been proposed (see History) that all enlisted men of the Medical Department be absorbed in a Medical Auxiliary Corps (M. A. C.) and the Veterinary Corps (V. C.), thus creating an enlisted section of such corps.

In time of peace the enlisted men of the Medical Department are so distributed on the recommendation of The Surgeon General as to meet the needs of all departmental activities. These men are enlisted directly in the Medical Department or may be transferred to it, on their own application, from other branches of the Army.

Instruction. Immediately upon enlistment the recruit is given a thorough basic course of training to acquaint him with the general duties of a soldier. This course is identical with that given the infantry soldier and includes the followng:

Knowledge of Articles of War pertaining to enlisted men.
Knowledge of orders pertaining to enlisted men.
Knowledge of Army Regulations pertaining to enlisted men.
Military courtesy and customs of the service.
Uniform regulations.
Physical training.
Personal hygiene and first aid.
Care of quarters.
The soldier, dismounted, without arms.
The soldier, instruction, dismounted, with rifle.
The squad, close order.
Care, making up and use of personal equipment.
Interior guard duty.
Individual cooking.
Tent pitching and camp expedients, including camp sanitation.
Marches and march discipline.
Rifle or pistol marksmanship (elementary target practice).
Defense against Chemical Warfare.

Upon the completion of this basic course the enlisted man then is assigned to duty in his medical formation or establishment and gradually acquires, often unconsciously, a practical working knowledge of the many duties devolving upon this class of personnel. As far as possible a rotation in duty assignments is made in an effort to broaden the training and experience of medical soldiers. There are times however when, because of his technical aptitude or qualifications, such as in the case of a cook or a motor mechanic, a man is kept exclusively on one kind of duty throughout his entire service.

The fact that the Army has become a highly specialized organization is clearly recognized by the Medical Department. In addition to the knowledge they acquire daily through the work assigned them to perform, enlisted men are given every opportunity for self study and are required to attend classes of instruction carried on from time to time by the officers and non-commissioned officers of their unit. This instruction embraces any of the activities required of the Medical Department. There is however a minimum amount of technical instruction which must be taken by every man. For those ambitious men who have qualified in such local courses as may be conducted, special courses at the Medical Department service schools and in corps area laboratories are maintained in such specialities as X-ray work, laboratory methods, dental hygiene, and instructor non-commissioned officers.

Specialists. Privates first class and privates of proven proficiency are eligible for specialist ratings carrying an increase of pay. To be eligible for a rating as a specialist, an enlisted man of the Medical Department must have had a certain amount of service or experience and demonstrate to the satisfaction of his commanding officer that he possesses the qualifications required for the specialist rating he seeks. All enlisted men of the

Medical Department are eligible for any rating, appropriate to the duties being performed, that is authorized for any branch of the Army. In addition to these general ratings which are available, certain group ratings adapted to its specific technical requirements have been specially authorized for use by the Medical Department. They embrace medical technicians, dental technicians, laboratory technicians, pharmacists, sanitary technicians, surgical technicians, and X-ray photographers. The specifications concerning these group ratings are clearly set forth in Army Regulations. Every recruit joining the Medical Department is made acquainted with the scope of those specifications and in the performance of his technical duties is encouraged to use them as a basis for personal study and training in his efforts to qualify for a specialist rating. Likewise in preparing for the technical instruction of enlisted men under their command officers so far as practicable arrange their schedules so as to embrace the progressive scope of those specifications.

The term *medical technician* includes all nursing activities. The term *dental technician* includes dental mechanics, dental hygienists, and chair assistants. The term *laboratory technician* includes laboratory foremen, microscopists, and general laboratory workers. The term *pharmacist* includes all men employed on pharmaceutical and dispensing work. The term *sanitary technician* includes assistants to medical inspectors, field foremen, etc. The term *surgical technician* includes operating room workers, anaesthetists, artificial limb fitters, anatomical artists, and assistants to various kinds of surgical operators. The term *X-ray photographer* includes men who can assemble, install, and operate X-ray machines and accessories as well as taking and developing the plates and films required in roentgenology.

In addition to the above, for the Army at large, over 225 classes of duty are recognized for purposes of specialist ratings. While enlisted men of the Medical Department are eligible for any of these ratings, those most commonly recognized for purposes of increased pay include bakers, chauffeurs, clerks, cooks (a hospital cook carries a rating higher than any other cook), gardeners, instructors, auto mechanics, motorcyclists, telephone operators, photographers, tire repairers, stenographers, storekeepers, and wagoners.

Promotion. As regards promotion, privates of the Medical Department may be promoted to the grade of private first class by their immediate commanding officer. For appointment to this grade no formal examination is required but all appointees must show evidence of intelligence, soldierly qualities and aptitude for future promotion.

Non-commissioned officers are appointed permanently or temporarily. As evidence of their appointment they are issued a *Warrant.* (Fig. 5.) The temporary class includes those non-commissioned officers appointed to meet the general requirements of an expanding Army in time of war or some of those appointed in time of peace for special duty with a medical regiment or a medical squadron. Such appointments are automatically vacated upon the termination of the emergency or special duty. All other appointments are permanent. For promotion to the grade of corporal, no formal examination is required, demonstrated fitness being the guiding factor. All appointments above the grade of corporal are contingent upon passing a satisfactory examination.

In the regular army permanent appointment to the grade of master sergeant, technical sergeant, or staff sergeant is made only by The Surgeon General, after a competitive examination held throughout the service.

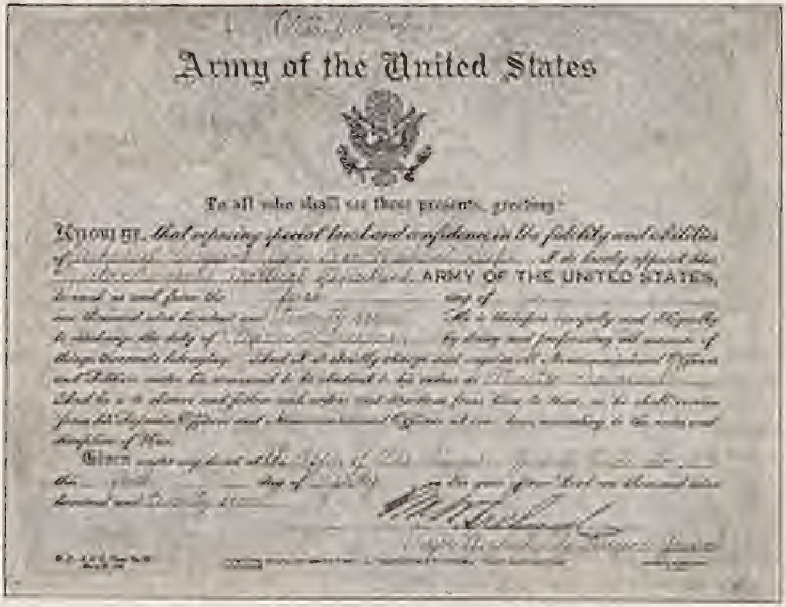
Sergeants and corporals are appointed by a corps area or department surgeon, or by The Surgeon General if serving in commands under the immediate supervision of the War Department. To establish eligibility for examination for permanent appointment as a master, technical, or staff sergeant, a minimum length of military service is prescribed. For example, to qualify for an examination as a master sergeant the candidate must have served not less than two years as a technical sergeant or staff sergeant. In examining candidates for non-commissioned officer grades written, oral, and practical tests are employed. Certain other factors such as character and habits, military bearing, length of military service, disciplinary control of men, and general efficiency in present grade, are also taken into consideration and given a certain fixed value. In addition to these personal attributes the subjects in which a candidate must qualify in passing through the grades of sergeant, staff sergeant, technical sergeant, and master sergeant are:

Clerical ability (grammar, penmanship, typing, and spelling), Drill, Arithmetic (grammar school only), Nursing, Pharmacy, First aid and minor surgery, Hygiene and sanitation, Army Regulations, Company or detachment administration, The register of sick and wounded, Mess management, Manual for Courts Martial, Organization and functions of the Medical Department, Principles of supply, Materia medica, Control of communicable diseases.

The duties of medical soldiers in time of peace are chiefly concerned with the care of the sick, sanitation, and general preparation for war; that they are many, varied, and important may be gathered from the scope of instruction outlined for them so briefly in this handbook.

The N. C. O. The principal duties of noncommissioned officers of the Medical Department are to maintain discipline in its various formations and establishments and watch over their general police; to supervise the duties and assist in the instruction of subordinate personnel at stations and in the field; to look after and distribute supplies; to care for government property; to supervise the preparation and serving of food; to compound medicines; and to prepare reports and returns. There are many other equally important and diversified duties which may, by proper authority, be required of them.

The senior noncommissioned officer must be an efficient disciplinarian, expert clerk, accurate arithmetician, and a trustworthy pharmacist, with as much knowledge of materia medica, therapeutics, and minor surgery as will enable him to give sound advice and suitable treatment in the minor ailments and accidents which in civil life are dependent on the resources of domestic medicine or the knowledge of the nearest pharmacist; in addition, he must have the higher knowledge which enables the experienced nurse to appreciate the condition of those who are seriously ill, that their improvement may be fostered and all harmful influences excluded. At small stations, during the temporary absence of the medical officer, the unforeseen casualties and even many of the exigencies of military life impose duties upon him the satisfactory performance of which may be of vital importance to the individuals concerned.



Army of the United States

To all who shall see these presents, greeting:

Know ye ... ARMY OF THE UNITED STATES,

Given

Fig. 5. Warrant of N. C. O.

Much of the success to be achieved by any organization will depend largely upon the character and proficiency of its noncommissioned officers. To summarize, the noncommissioned officer should possess the following basic qualifications: *Leadership—the ability to command men.* He must cause those under him promptly and readily to obey and honestly execute his lawful orders; he must also inspire in them such zeal, confidence, and respect as will prompt them to follow him even on a disagreeable or dangerous task; *Loyalty.* This must be inspired as well as exacted. If he is to expect and require absolute loyalty from his subordinates he must in turn be loyal to them, help them in their problems, and be just and fair in his dealings with them under all circumstances; *Sense of responsibility.* He must always do well and thoroughly the task before him; *Force.* This he must not only possess but exercise in a quiet and soldierly manner; *Dignity.* By his general conduct and bearing, characterized especially by reserve, orderliness, neatness, and superiority in manner, he must arouse in his associates a high feeling of estimation and respect; *Soldierly bearing and neatness of dress.* These are indispensable military requisites to any noncommissioned officer; *Professional or technical qualifications.* He must completely master and have a detailed knowledge of all the duties devolving upon him; *Zeal and interest.* These he must never permit to relax; *Good habits.* Without these he cannot maintain authority over his subordinates and hold their respect; *Justice and common sense.* He must be fair in his dealings with all. Many problems are solved and difficulties avoided by the application of common sense; *Ambition.* He must be continuously imbued with the determination so to perform his duties and accomplish results as to merit official recognition and move upwards in grade; *Dependability and reliability.* He must discharge well and faithfully the duties expected of him. No greater compliment can be paid a noncommissioned officer than to have his commanding officer say of him that he is absolutely reliable and dependable under all circumstances.

Civilian Employees. The Medical Department continuously employs a large group of civilians, many of whom work side by side with military personnel in carrying on the work with which the department is charged. At present (1927) there are about 1400 on the rolls. During the World War they aggregated a group of 20,000 persons. In hospitals they are employed as clerks, reconstruction aides, dental hygienists, student nurses, dietitians, cooks, mess attendants, etc.

In The Surgeon General's Office, as well as in the office of department and corps area surgeons, practically all of the clerical work is performed by civilian employees.

In Medical Department schools and supply depots they are employed as clerks, instructors, messengers, janitors, watchmen, inspectors, packers, etc. At the Army Medical Museum and Army Medical Library they include many expert technicians.

These civilian employees, many of whom have elected service with the Medical Department as their life career, have always contributed materially to any of the success achieved by the Department. They are a distinct asset. Because their work is carried on in what might be termed the back-ground of the military establishment it is seldom accorded the general recognition it so justly merits.

Reserve. The Medical Department Reserve consists of citizens enrolled in the *Officers Reserve Corps* and *Enlisted Reserve Corps.* They hold themselves in readiness to respond to active duty in any emergency. In time of peace they pursue a systematic course of study at home and at intervals attend a training camp.

The sections of the Officers Reserve Corps are medical, dental, veterinary, medical administrative and sanitary. The *Nurse Corps Reserve* comes from the American Red Cross. The Enlisted Reserve Corps has not yet been developed.

In time of war reserve personnel are eligible for and will be assigned to duty with the Regular Army or the National Guard as well as in their own component, the Organized Reserves.

Of all the officers in the Reserve Corps in 1927, about sixteen percent are Medical Department, excluding those serving in the National Guard. They are distributed approximately as follows: Medical 10,000, Dental 4300, Veterinary 1000, Medical Administrative 1600, and Sanitary 500; aggregate 17,400 officers.

The Reserve Officers Training Corps (*R. O. T. C.*) units now in operation in various civil medical, dental, and veterinary schools throughout the country are an important potential reserve force of the Medical Department.

Of these there are (1927) twenty-four medical units with a total enrollment of 3500 candidates, eight dental units with 1400 candidates, and four veterinary units with 250 candidates; aggregate, 5150 candidates for the Medical Department.

Board. *The Medical Department Board* sits permanently at the Medical Field Service School, Carlisle Barracks, Pa. Its purpose is to consider such subjects pertaining to the Medical Department as may be referred to it by The Surgeon General, and to originate and submit to him recommendations looking to the improvement of the Medical Department, particularly for service in the field. It is constantly studying the organization, equipment, and functions of our field units.

Equipment Laboratory. The Medical Department Equipment Laboratory is maintained permanently at the Medical Field Service School, Carlisle Barracks, Pa. It has been in constant operation since the inception of that school. It carries out developmental work under the general direction of The Surgeon General and the immediate supervision of the Commandant of the school. It has an up to date set of shops in which to develop its various experimental products, and when they are completed it subjects its projects to requisite practical tests in conjunction with the demonstration troops on duty at the school.

This equipment laboratory has become an asset of first importance to the Medical Department. It is constantly engaged on projects having to do with the improvement of our field equipment. It approached its equipment problems from a front to rear aspect.

Among many of its new developments may be mentioned first aid packet and wound dressings, individual technical kits for all personnel of the Medical Department, a metal litter for use in airplanes, trenches, etc., a vastly improved type of animal-drawn ambulance, capable of carrying cargo as well as patients, a six-patient motor ambulance, and another ambulance of smaller design for front-line work, standard containers for our field medical outfits, etc. Not only have many ingenious useful devices been turned out by this laboratory, but in connection with them it has had much to do with prescribing the method of proportionately distributing, packing, and transporting this field equipment. The officer in charge of the equipment laboratory is known as the *"Director."*

Schools. In addition to the training carried on locally and almost daily at all posts, camps, and stations, the Medical Department maintains special schools for the instruction of its personnel. These schools function under the direct supervision and control of The Surgeon General.

The **Army Medical School,** established in 1893, is located at the Army Medical Center, Washington, D. C., and conducts courses for both officers and enlisted men. It deals largely with technical and professional matters of special military importance. The courses are divided into basic, advanced, and special. Enlisted men who exhibit aptitude are given training there as bacteriological, chemical, and X-ray technicians. In addition to instructing and training officers and enlisted men the Army Medical School also conducts investigations and researches, and produces most of the vaccines and biological products used by the Army. In the past twenty years it has turned out enough typhoid-paratyphoid vaccine to vaccinate almost one-fifth of our entire population.

The **Army Dental School,** established in 1922, and the **Army Veterinary School,** established originally at Chicago in 1917, are also located at the Army Medical Center, and provide for dental and veterinary personnel identically the same type and scope of training, adapted to their professions, as the Army Medical School. In the former there are courses for enlisted men in dental hygiene and mechanics, and at the latter in meat, food, and dairy hygiene.

The **Army School of Nursing,** at the Army Medical Center, is conducted in connection with the clinical work available at Walter Reed General Hospital, and trains young women for the nursing profession. Most of its graduates enter the Nurse Corps of the Army or other government services. It was established in 1918.

The **Medical Field Service School,** at Carlisle Barracks, Pa.—a station wholly occupied and administered by the Medical Department—provides training in subjects which will fit Medical Department personnel for duty in the field. It was established in 1920. Throughout the year it conducts various courses for both officers and enlisted men. The latter is designated as the noncommissioned officers course and is open to any noncommissioned officer who desires to attend.

The **School of Aviation Medicine** traces it origin back to 1917 and is located at the Air Corps Training Center, Fort Sam Houston, Texas. It trains medical officers in the duties of a flight surgeon and also conducts experimental work and investigations relating to the medical phases of flying. While the faculty consists of medical officers and its technical operation is controlled by The Surgeon General, this school primarily functions under the immediate jurisdiction of the Chief of the Air Corps.

To keep abreast of the times officers of the Medical Department are also authorized from time to time to attend hospitals and other civil institutions for special courses of instruction. They are also eligible to and do attend other service schools of the Army. They may also enroll for any of the correspondence courses conducted by the military establishment.

Practically every hospital and other activity of the Medical Department is a local training school for its personnel. Enlisted men particularly are given such technical and general instruction by their local commanders as will best fit them for the duties they are to perform.

Library. The Army Medical Library is commonly known as the Library of The Surgeon General's Office, and is located in Washington, D. C. It is not however, as popularly supposed, housed in The Surgeon General's Office. It occupies a large building, jointly with the Army Medical Museum, in another part of the city.

The Army Medical Library originated with a small collection of books in the S. G. O. over a century ago. It is now the great central medical library of reference for the nation. Its doors are open to the public and its vast store of literature is available for loan to individuals, to schools, to societies and public libraries in every state of the Union. The library now (1927) contains over 800,000 books and pamphlets on medical and allied matters, all of which are catalogued and arranged for ready use. Its archives contain many ancient, rare, and valuable documents.

This library operates under the direct supervision and control of The Surgeon General. It is directly administered by a medical officer whose official designation is the *Librarian.*

Museum. The Army Medical Museum, established in 1862, and located in Washington, D. C., occupies the same building as the Army Medical Library. The Museum is organized and functions as part of the Office of The Surgeon General.

The object of the Army Medical Museum is to exhibit specimens and appliances illustrating general sanitation, personal hygiene, disease prevention, wounds of war and agencies producing them. It has a large display of anatomical specimens, parasites, and instruments and appliances of special interest.

A medical officer with considerable experience as a pathologist has charge of the general administration of the museum, under the direction of The Surgeon General. He bears the title of *"Curator."*

Contributions to this museum are made not only by the Army at large, but by the civilian medical profession throughout the country. It is utilized freely by the latter.

Medical Attendance. The principal agencies maintained for providing or furnishing medical attendance in the Army are, at permanent stations, *hospitals* and *dispensaries,* and in the field, in addition to hospitals and dispensaries, *aid stations, collecting stations* and *hospital stations.* In general, patients proceed to or are transported to these agencies for the initiation of observation and treatment. Relatively few patients are treated in their quarters but when so authorized are visited by a medical officer as often as may be necessary.

Ordinarily, *"Sick Call"* is held daily or oftener if necessary to provide medical attendance at a certain hour for persons on a duty status, or to provide for the admission to hospital or quarters for further examination of those requiring treatment. At sick call the enlisted men of each organization or detachment who require medical attention are conducted to the hospital or dispensary by a noncommissioned officer of the unit concerned, who presents to the medical officer in attendance the daily sick report containing the names of the sick and injured. The medical officer then determines as quickly as possible those men physically unfit for duty and admits them to hospital or quarters as the circumstances may warrant. Of course, those taken sick at any other hour and requiring immediate treatment are taken or conducted to the hospital or dispensary in the same manner.

Dispensaries. Dispensaries are Medical Department establishments intended primarily to furnish routine out-patient service for those not requiring treatment in a hospital. The senior medical officer on duty at the dispensary is the commanding officer thereof. Dispensaries provided by and for the Army in peace or war are divided into two main classes—the *fixed or stationary,* designated as station dispensaries and general dispensaries, and the *mobile or field,* designated as unit dispensaries.

Dispensaries are identified as shown in the following examples—"Station Dispensary, U. S. Army, Washington Barracks, D. C.", "General Dispensary, U. S. Army, Washington, D. C."

Dispensaries employed in a theatre of operations bear a number instead of a location, e. g. 3rd General Dispensary.

A *station dispensary* is provided to serve the non-hospital needs of personnel located at a military post or station and normally treats outpatients only from commands at that station. It is administered under the control of the commander of the station to which it pertains.

A *general dispensary* is provided to serve the non-hospital needs of military personnel located in a large city, military district, or prescribed military area. It is administered under the direct control of the corps area, department, district, or tactical commander under whom it may be serving.

A *unit dispensary* is provided similarly to serve the troops in the field. All units to which medical officers are attached are supplied with field medical outfits for this purpose. For example, in an infantry regiment four sets of field equipment are furnished with which to establish a dispensary at regimental headquarters and with each battalion. When in the combat zone the term dispensary is not used, *"Aid Station"* being substituted therefor. These formations are identified as follows: "Battalion Dispensary, 3rd Battalion, 2nd Infantry," "Aid Station, 3rd Battalion, 2nd Infantry." Where but one dispensary is being operated for an entire regiment "Regimental Dispensary, 2nd Infantry" may be used.

Hospitals. In conformity with the phraseology used in the Geneva Convention military hospitals are divided into two main classes—the *fixed or stationary* and the *mobile or field.* Only two types of fixed hospitals are employed—*Station Hospitals* and *General Hospitals.*

The mobile or field hospitals are—*Hospital Stations, Surgical Hospitals, Evacuation Hospitals,* and *Convalescent Hospitals.*

In the Zone of Interior, fixed hospitals are designated as shown in the following examples—"Station Hospital, U. S. Army, Camp Meade, Md.", "Letterman General Hospital, U. S. Army, San Francisco, Calif."

In a theatre of operations all hospitals bear numbers in a consecutive series for each type. To avoid conveying any information to the enemy their location is omitted, but the Army Post Office number may be added on communications to or from them. For example "8th Station Hospital A. E. F.", "16th General Hospital," "24th Surgical Hospital," "48th Evacuation Hospital, A. P. O. No. 212."

Fixed hospitals are not used in the combat zone. They are employed in the communications zone and the zone of the interior.

A station hospital normally receives patients only from its immediate vicinity and operates under the jurisdiction of the local commander. On the other hand, general hospitals are established to serve widespread rather than local needs.

General hospitals within the continental limits of the United States function under the control of The Surgeon General. Those in the overseas possessions and those pertaining to a theatre of operations function under the control of the department or tactical commanders under whom they may be serving. In a theatre, general hospitals receive nearly all the sick and wounded coming into the communications zone from the front on hospital trains. Whenever three or more general hospitals are grouped at one place an administrative and clinical organization known as a "*hospital center*" is created. A *convalescent camp* is established as part of such center.

Mobile hospitals are provided to meet the needs of troops in the field or in campaign at places where it is impracticable to establish stationary hospitals. They also serve as relay points in the evacuation of patients from the front to fixed hospitals in the rear. Hence the normal field of usefulness of mobile hospitals is in the combat zone. They function under the general control of the army commander; their activities being closely supervised and coordinated by the army surgeon, corps surgeons, and the division surgeons, within their respective zones.

Fixed hospitals provide definitive or permanent treatment; mobile hospitals that of an emergency or temporary character.

No standard capacity is prescribed for fixed hospitals (station hospitals and general hospitals) used in time of peace, nor ordinarily in the case of those situated in the zone of the interior in time of war. The capacity of such hospitals is adapted to general requirements and the facilities locally available. All units employed in a theatre of operations have a definite patient (bed) capacity prescribed in their respective tables of organization.

General Hospitals. For the peace establishment 7 general hospitals are in operation. Those within the continental limits of the United States function directly under the control of The Surgeon General.

The general hospitals are: The *Walter Reed* at Washington, D. C., the *Letterman* at the Presidio of San Francisco, Cal., the *Fitzsimons* at Denver, Colo., the *Army and Navy* at Hot Springs, Arkansas, the *William Beaumont* at El Paso, Texas, the *Sternberg* at Manila, P. I., and the *Tripler* at Honolulu, H. T.

Excepting the *Army and Navy,* all these hospitals bear the names of deceased officers of the Medical Corps who rendered conspicuous service during their military career.

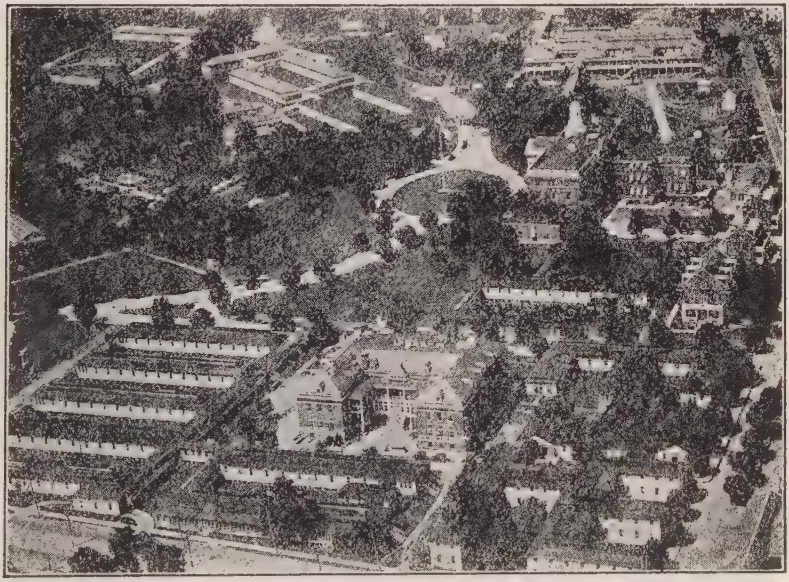


Fig. 6. Walter Reed General Hospital. Note type of temporary buildings erected during World War. (Photograph by Army Air Corps)

The Fitzsimons General Hospital is especially conducted for the treatment of cases of tuberculosis. The Army and Navy General Hospital is maintained largely for the treatment of patients who can be benefited by hydrotherapy.

These general hospitals, of which the Army and Navy is the smallest and Fitzsimons the largest, vary in capacity from 300 to 2000 beds, but in time of war would be expanded to their maximum capacity. (Fig. 6) At present they provide an aggregate of about 5300 beds. Beneficiaries of the U. S. Veterans Bureau are patients in some of these general hospitals.

Station Hospitals. At the various camps, posts, and stations maintained by the Army either a dispensary or station hospital is maintained to meet the local needs. Throughout the military establishment there are over 100 of these station hospitals of various capacities in constant operation in time of peace. The Station Hospital at Fort Sam Houston, Texas, with a capacity of 600 beds, is the largest. It is virtually a general hospital in all except name, operates under the direct control of the corps area commander, and receives patients from points throughout the 8th Corps Area.

The station hospitals provide an aggregate of about 6400 beds. Each station hospital now in existence would be expanded to its maximum capacity in time of war.

Corps Area Laboratories. The primary purpose of a corps area or department laboratory is to furnish a superior laboratory service for all military commands located within the geographical limits of a corps area or department, when local laboratories cannot satisfactorily turn out the work required.

When necessary one laboratory of this type is maintained in each corps area. At times one laboratory may care for the needs of several adjoining corps areas.

Corps area laboratories conduct special and general laboratory procedures, embracing such activities as bacteriological investigations, serological work including particularly the Wassermann and other standard complement fixation tests, examination of specimens of human tissue, and analyses of water and food supplies.

The personnel of these laboratories also conduct investigations regarding epidemics of disease and unsanitary or other conditions which menace health. They also conduct special courses in laboratory technique for selected nurses and enlisted men of the Medical Department serving in the respective corps areas.

Medical Supply Depots. In time of peace only four medical supply depots are in operation within the continental limits of the United States. These are located at New York, St. Louis, San Francisco, and San Antonio. There is also one depot in each of the overseas departments.

In time of war additional medical supply depots would be established within the continental limits of the United States, so as to provide one depot to serve the needs of each corps area as well as general needs throughout the country.

While the procurement of medical supplies is directed and supervised largely by the Finance and Supply Division of The Surgeon General's Office the actual purchase is accomplished by the various depots, the New York Depot being the leader in this respect.

When serving as a section of an intermediate depot containing activities pertaining to other branches, the depot is designated as the *"medical section"* of such depot and the officer in charge as the *"medical supply officer."*

Ambulances. Ambulances are vehicles provided for service exclusively in the Medical Department. Two types are supplied—animal drawn and motor. Their capacity varies from four to six patients lying on litters (Fig. 7).

Under exceptional circumstances the use of airplanes for ambulance purposes is authorized.

Ambulances are permanently marked with the Red Cross in order to afford them protection under the terms of the Geneva Convention.

Ambulances are provided with only sufficient equipment, such as litters, blankets, and splints, as to assure the comfort and safety of patients in transit.

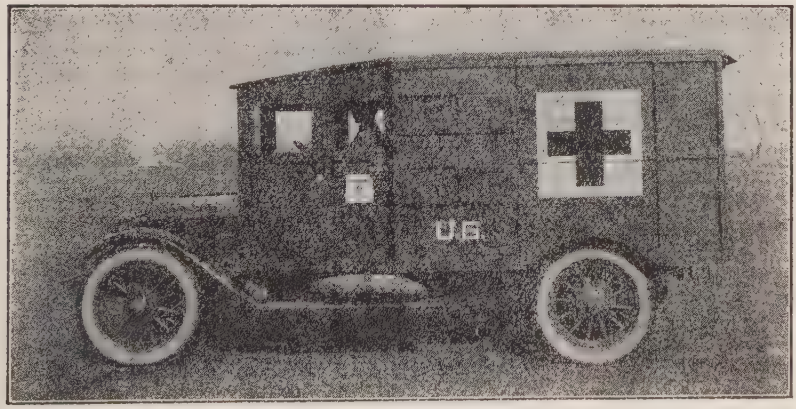


Fig. 7.—New Type of Motor Ambulance. Accommodates 6 patients on litters; 3 in upper tier and 3 in lower

Ambulances are used only for the following purposes: 1. Transportation of the sick and wounded and the necessary Medical Department personnel on duty therewith. 2. The recreation of convalescent patients. 3. The instruction of personnel of the Medical Department in the duties of the ambulance service. 4. In the field, in urgent cases, for the transportation of medical supplies and Medical Department personnel.

All persons are prohibited from using ambulances for any other purpose. Ambulances are operated under the control and in the hands of Medical Department personnel, wagoners or chauffeurs from the enlisted men thereof being specially trained for this work.

Insignia. The official emblem of the Medical Department is a device known as the *Caduceus* (Fig. 8). As a distinguishing mark it is used on equipment, uniforms, guidons, etc.

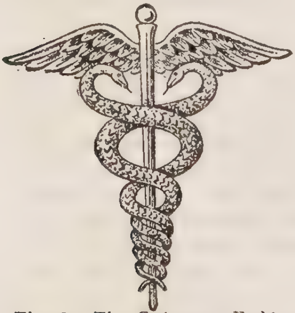


Fig. 8. The Caduceus. Emblem of the Med. Dept.

The Caduceus was first formally adopted by the Medical Department of our Army in 1856, when it appeared on the chevron worn by the hospital steward. It did not become a part of the uniform of the medical officer until 1902. It is now worn as a collar ornament on the uniform of all Medical Department personnel. On it small letters are superimposed to identify those belonging to the following groups: Dental Corps (D), Nurse Corps (N), Medical Administrative Corps (A), Veterinary Corps (V), Sanitary Corps (S), and Contract Surgeons (C). By medical officers it is worn plain.

The Caduceus as now employed consists of a staff, around which are entwined two serpents. At the head of the Staff are two outstretched wings. Its symbolism is somewhat obscure. In fact some students of mythology and sticklers for tradition claim that we have adopted solely the wand of *Mercury* and that it really has no medical significance. Mercury was the fleet-footed messenger of the gods. He was, however, also in league with traders and rogues. His emblem, the wand, was the badge of the non-fighting man—the symbol of peace. It is related that Mercury struck two fighting snakes with an olive branch and that they were turned into friends, hence the emblem. The wings represent his fleetness. It is contended that the Aesculapian staff and serpent, the latter closely coiled around the walking stick, would be more appropriate for the Medical Department. Although *Apollo* was the real god of medicine, *Aesculapius* is commonly alluded to as the father of medicine. The physician of today still takes the oath of *Hippocrates,* beginning with the words "I swear by Apollo, the physician, etc." Apollo was reputed to be the father of Aesculapius and to have derived his power of divination and healing through slaying the serpent Python. Another tradition has it that as Aesculapius one day sat in his tent treating a patient, a snake entered and entwined itself about his walking stick, thus conferring the gift of wisdom upon him. The serpent has always been recognized as a symbol of wisdom as well as of the medical cult.

So while we may have strayed somewhat afield in our efforts to be artistic, let us regard our Caduceus as representing the following: the wings, the fleetness we always strive to exercise in going to the aid of the sick and wounded; the staff, our determination to reach the patient even if we have to hobble along, footsore and weary, with the assistance of a cane; and the serpents, the wisdom we employ in ministering to the ills of mankind. (*Author's version.*)

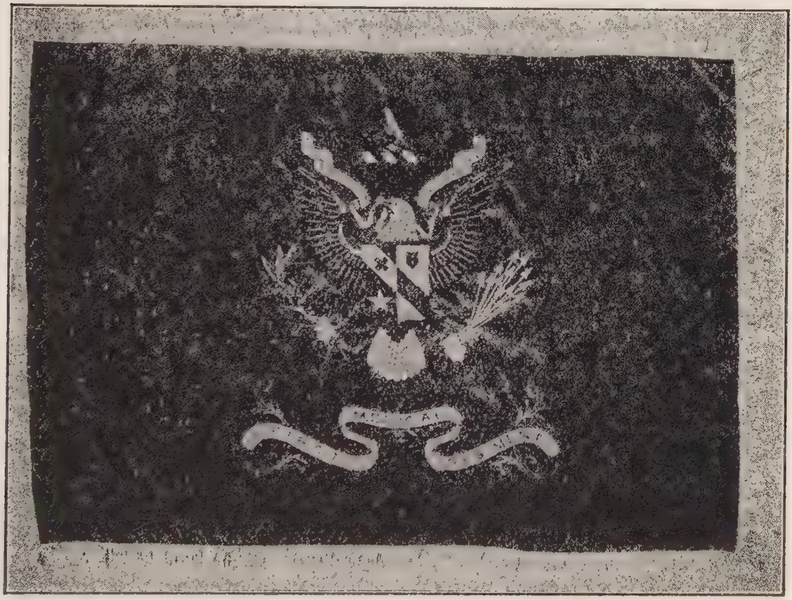


Fig. 9. Regimental Standard of the First Medical Regiment.

Colors. The War Department has officially prescribed for every branch of the Army a distinctive color, or combination of colors. In the case of the Medical Department this is maroon, piped with white.

The regimental standard carried by a medical regiment is an example of the employment of this color scheme (Fig. 9).

Should the Army ever return to the blue uniform previously worn in time of peace, trouser stripes and facings on such uniform worn by Medical Department personnel would likewise be of maroon piped with white.

Green has been assigned as a color to further distinguish the Veterinary Service. A green cross instead of a red cross is employed on veterinary ambulances and on the markers and flags used by veterinary formations and establishments. The caduceus and letters on the maroon guidon of a veterinary company are green instead of white.

Publications. All matters of general policy and permanent administrative application involving the Medical Department are published to the service through the medium of Army Regulations, Training Regulations and other War Department documents, on the recommendation of The Surgeon General. All such publications under Medical Department caption are actually prepared in The Surgeon General's Office.

Supplementing these The Surgeon General from time to time issues certain *"Circular Letters"* on technical subjects, and even on administrative matters if the latter are covered in a general way in existing regulations.

Annually The Surgeon General prepares for the Secretary of War a report covering the operations of the Medical Department for the entire year. This report contains a general review of all the activities upon which the Medical Department has been engaged and a voluminous tabulation of vital statistics. This report is turned out at the Government Printing Office and distributed for reference purposes throughout the service and to libraries and other agencies interested in public health. *The Annual Report of The Surgeon General of the Army* for 1926 embraces 473 pages of printed text.

The *Army Medical Bulletin,* published by the press at the Medical Field Service School, Carlisle Barracks, Pennsylvania, appears from time to time and is distributed for the general dissemination of information relating to administrative reports, statistics of disease, Medical Department training projects and other matters of a medico-military nature to members of the Medical Department of the Army of the United States—Regular Army, National Guard, and Organized Reserves.

A monumental work, a *History of the Medical Department in the World War,* in 15 volumes, is now nearing completion, the majority of the volumes already having been distributed. The Medical Department published a similar history on the *War of the Rebellion* in 6 Volumes, which appeared between the years 1870-1888.

In addition The Surgeon General compiles and distributes from time to time tables on vital statistics. In time of war he also prepares technical manuals on professional topics so that officers will have available technical information on which to standardize methods of treatment.

Tables of Organization. The organization of every type of unit employed by the Medical Department is prescribed in an official table published by the War Department, on the recommendation of The Surgeon General. These tables exhibit precisely the personnel and transportation allowed. The commissioned and enlisted personnel are listed by grades and specialists ratings. The following is a list of the official tables of organization pertaining to the Medical Department.

T. of O.	**War Strength.**
81 W	Medical Regiment
82 W	Service Company, Medical Regiment
83 W	Collecting Battalion, Medical Regiment

T. of O.	War Strength—Continued.
84 W	Ambulance Battalion, Medical Regiment
85 W	Hospital Battalion, Medical Regiment
86 W	Veterinary Company, Medical Regiment.
90 W	Summary of Medical Department Personnel in Infantry Division
182 W	Headquarters Corps Medical Service
190 W	Summary of Medical Department Personnel in Army Corps Troops
282 W	Headquarters Army Medical Service
283 W	Evacuation Hospital
284 W	Surgical Hospital
285 W	Convalescent Hospital
286 W	Medical Laboratory, Army or Communications Zone
287 W	Medical Supply Depot, Army or C. Z.
288 W	Veterinary Evacuation Hospital
289 W	Veterinary Convalescent Hospital
489 W	Medical Squadron, Cavalry Division
490 W	Summary of Medical Department Personnel in Cavalry Division
677 W	General Dispensary
678 W	Headquarters Medical Service, C. Z.
679 W	Medical Laboratory, Aviation
680 W	Medical Laboratory, General
681 W	Medical Department Concentration Center
682 W	Hospital Train
683 W	General Hospital
684 W	Station Hospital, Communications Zone
686 W	Veterinary General Hospital
687 W	Veterinary Station Hospital
688 W	Hospital Center
689 W	Auxiliary Surgical Group
707 W	Office of The Surgeon General
781 W	Army Medical Center
782 W	Army Medical School
783 W	Army Dental School
784 W	Army Veterinary School
785 W	Medical Field Service School
786 W	Station Hospitals, Zone of the Interior
787 W	Veterinary Station Hospitals, Zone of the Interior
788 W	School of Aviation Medicine
	Peace Strength
81 P	Medical Regiment
82 P	Service Company, Medical Regiment
90 P	Summary of Medical Department Personnel in Infantry Division
489 P	Medical Squadron, Cavalry Division
490 P	Summary of Medical Department Personnel in Cavalry Division
707 P	Office of The Surgeon General.

CHAPTER IV

MEDICAL ASPECTS OF MOBILIZATION

Introduction. Contrary to popular opinion the entire man-power of the nation cannot spring to arms overnight. Mobilization for national defense is a gradual and intricate process and to provide a well-balanced force must be systematically handled.

The man-power of the country is readily available, but it is the *lack of equipment and supplies* with which the troops must be provided in order to discharge properly their various functions that retards the mobilization of many units. In time of peace we cannot afford to store as a war reserve all of the equipment to be needed by our vast army in time of war. In fact, such a course would be foolhardy in view of the improvements daily being made. Figuratively speaking, articles acceptable today may become obsolete tomorrow. To function satisfactorily the Army needs thousands of highly technical articles, including guns, airplanes, X-ray machines, etc. that cannot be produced immediately upon the advent of war.

Even the matter of providing clothing and individual equipment for millions of men is a stupendous task and takes considerable time. Mobilization therefore is absolutely dominated by our ability to equip and supply the men called to the colors.

For a maximum effort, and when we speak of a maximum effort we mean war with any of the leading nations of the world, it may take over a year to fully mobilize, equip, and supply the size of the military force eventually to be needed.

Many units of the Organized Reserves will not be called to active duty for months after M-day. As part of our war-planning they are assigned a definite place in our *priority schedule,* which aims at calling them out only when needed to balance the gradually growing "machine," and when they can be supplied.

The transition of the Medical Department from a peace to a war footing is effected gradually and on a parity with other branches of the service, so as to provide an adequate and well-balanced medical service and veterinary service for all the troops under arms at any one time.

Such important field units as surgical hospitals and evacuation hospitals will have to share the fate of others on the deferred priority schedule and patiently "mark-time," as it were, until the field army to which they belong can be mobilized.

In the preceding chapter the mission of the Medical Department is briefly set forth. In a general mobilization for war the paramount mission of the Medical Department is the conservation of man-power—the preservation of the strength of the forces in the field. When war is at our door every member of the Medical Department should constantly bear this objective in mind. Save for the enormous additional burden carried, the duties and responsibilities of the Medical Department differ but little in peace or war.

Personnel. In any general mobilization the *strength of the Medical Department* of the military establishment, veterinary service included, will be approximately as follows: officers about 1%, nurses about 1.4%, and enlisted men about 10%, of the aggregate strength enrolled.

For a maximum effort it has been estimated that we might require as many as 28,000 medical officers, 5,000 dental officers, 3,000 veterinary officers, 4,000 Sanitary Corps and M. A. C. officers, 56,000 nurses and 400,000 enlisted men—approximately one-half a million individuals in the Medical Department alone, to say nothing of the *thousands upon thousands of patients* from other branches to seek shelter, care and treatment at our hands.

It does not take any great stretch of one's imagination to visualize how carefully the organization of the Medical Department must be worked out to meet efficiently the enormous task it is to assume in war. At the very start of mobilization sickness begins and our activities quickly multiply. We must make hospitals ready for patients. Every man enrolled in the Army must be given a physical examination, receive his typhoid-paratyphoid inoculation, etc. Accordingly, to provide for these immediate needs all Medical Department units in existence on M-day enter upon a recruiting campaign and expand their accommodations. In addition, certain reserve personnel or units must be called to active duty.

Information. As part of its preparation for the ensuing campaign the Medical Department makes a special effort to acquire data concerning the sanitary conditions existing in each theater of operations, particularly with reference to the incidence therein of communicable or other diseases which might menace the health of our own troops. The assembly of information of this character is of extreme importance to the Medical Department and forms the basis for many of the sanitary orders to be issued.

Organization. The organization of the Medical Department for war is specifically laid down in various war plans or mobilization plans prepared in time of peace.

Every unit to be needed is provided for and the approximate time and place when and where it is to be called to duty clearly indicated under the various priorities prescribed.

It must be remembered that each unit, whether active or inactive, has a plan of its own covering in detail its organization and the steps necessary to be taken in preparing it for service.

Training. For the training of Medical Department personnel the schools now in existence will be gradually expanded to maximum capacity and utilized largely in training officers and men who occupy what may be termed *"key"* positions in units listed for mobilization. After the requisite course of instruction, this trained personnel will return to their units, and when the latter are mobilized act as the instructors for the personnel of units who have not had an opportunity to attend a school. This group includes commanders of various medical organizations, executive officers, chiefs of various professional services, laboratory men, X-ray men, etc.

All Medical Department detachments, medical regiments, and medical squadrons, will be mobilized and undergo training with the commands to which they belong. Some of the officers and enlisted men of these organizations will have had the advantage of a brief course of instruction at a service school, as above mentioned.

All other units of the Medical Department to be mobilized for utilization in the various theatres of operation and in the Zone of the Interior will be mobilized, recruited up to required strength, and trained as follows:

Hospitals of all types, hospital trains, hospital centers, concentration centers, general dispensaries, auxiliary surgical groups and general medical laboratories will come into being at such mobilization points as have previously been designated for them. Whenever practicable, medical laboratory units will be mobilized at corps area laboratories, aviation medical laboratories at stations where Air Corps personnel is being assembled and examinations of flyers conducted, and medical supply depots at the nearest medical supply depot.

While at their mobilization points, the character of training to be given the personnel of the above mentioned units will be: 1. Such *basic military training* as will quickly fit them for service as non-combatant soldiers, including drill in such formation as is adapted to the type of unit in which they are being assembled: 2. Such *basic technical training* in the various duties required of members of the unit, either individually or in groups, as may be afforded by the facilities available at the mobilization point.

Training in the *tactical* and *technical* employment of the unit as a whole will not be undertaken until the unit has reached its designated concentration area or other place where its complete organization equipment is to be furnished.

Equipment and Supply. In addition to what is already in stock the Medical Department will require a vast quantity of additional supplies and equipment not only for use in combat, but for the expansion of Zone of Interior installations taking place during the mobilization period. Just how, when, and where all of these supplies are to be procured, stored, and issued is worked out in advance as part of our peacetime activities.

One section of *The Surgeon General's Office* is devoted exclusively to this work. The requirements in terms of thousands upon thousands of articles of supply to be procured by the Medical Department for each month of operations after M-Day have been computed down to the last detail and are kept up to date by current studies in The Surgeon General's Office. This part of our war planning is carried on under the supervision and help of an *Assistant Secretary of War,* whose sole responsibility is that of seeing to it that the Army is amply, properly, and promptly supplied in time of war.

The Surgeon General computes all requirements, prescribes the rate of issue, and instructs the Medical Department field agencies—the medical supply depots—as to the part they are to play in procurement.

Medical supply depots are charged with the inspection and purchase of all supplies allocated to them for procurement. Upon mobilization, officers of the Medical Department, many of them members of the Sanitary Corps Reserve, well schooled in business methods and familiar with all the technical details involving the various items of supply, are assigned to these depots to assist in this important procurement work which, to a certain extent, remains continuous throughout the period of active operations.

In addition to the medical supply depots now in operation at New York, St. Louis, San Antonio, and San Francisco, depots would also be established at Boston, Philadelphia, Atlanta, Columbus, and Chicago so as to provide one depot for each corps area.

Because of the time required to get the industrial machinery in motion the Medical Department, as in the case of some other branches, has been authorized to procure and lay aside in time of peace certain essential articles of supply and equipment designated as *"war reserve."* For example, as part of its war reserve, we now have in our depots the equipment, completely assembled as a unit, less deteriorating items, for units such as surgical hospitals, evacuation hospitals, general hospitals, etc. These could be shipped at a moment's notice. The stock in each medical supply depot is so balanced as to cover the requirements of all the troops in the corps area it is serving. In time of war these would be the active issue depots on what might be termed the retail basis. Medical sections of general reserve depots are utilized chiefly for complete unit assemblages such as have just been mentioned with reference to surgical hospitals, etc. These reserve depots handle supplies on what might be termed the wholesale basis.

Articles of *individual equipment* issued by the Medical Department for mobilization include first aid packets, foot powder, adhesive plaster, and litters, for all troops; and the technical kits of Medical Department personnel. These are shipped to designated supply points. This individual equipment, including clothing, etc., is provided before thinking in terms of organization equipment.

Many units of the Medical Department will not be supplied with *organization equipment* until they reach their designated concentration area or, if a unit pertaining to the Zone of the Interior, a station preparatory to entering upon their duties. Practically all of the hospitals, laboratories, and supply depots pertaining to a Theater of Operations fall in this category.

All other Medical Department units such as medical detachments, medical regiments, medical squadrons, etc. will be supplied with organization equipment at the points where they are to undergo recruitment and training. The amount of organization equipment to be supplied for training purposes during the early phases of mobilization and when and where the complete equipment is to be assembled usually will be prescribed by the War Department, depending upon the circumstances existing at the time.

For all units there are prepared in time of peace *equipment tables* setting forth the items and amounts to which each organization is entitled. These complete equipment tables will be in the hands of all depots and units concerned. An official telegram to a supply depot stating simply "Send one general hospital equipment to—" is an example of brevity that will bring about the desired result.

Organization equipment for station hospitals functioning in the Zone of the Interior will be furnished when and as needed, by the medical supply depot serving the corps area in which they are located, upon the receipt of official notice by the depot that the unit is ready to receive its equipment.

The initial equipment of all other units or installations within a corps area will be provided for and suitable requisitions will be prepared under the direction of the corps area commander and sent to the nearest medical supply depot for issue.

Hospitalization. The term *"hospitalization"* is employed in a broad sense and includes not only shelter but the beds and bedding, messes, operating rooms, and all the other appurtenances necessary in providing adequate care and treatment for the sick and wounded. A term also used in connection with it is *"beds."* When so employed, "beds" mean patient capacity. For example, a hospital of 1000 beds is capable of caring for 1000 patients.

For purposes of computing allowances and developing a hospitalization program we again divide "beds" into two classes: *evacuation beds* and *treatment beds*. Evacuation beds are found in such units as surgical hospitals and evacuation hospitals at the front. These units are considered only as relay agencies and are not intended for the prolonged treatment and care of patients.

When *bed allowances* are laid down we consider only the treatment beds established in general hospitals, station hospitals, and convalescent camps, at their normal capacity. For general mobilization purposes, hospitalization is provided for roughly on the basis of our World War experience of 15% beds for the Theater of Operations and 7½% beds (initially) for the Zone of the Interior, computed upon the total strength present in the theater and interior respectively.

Another and perhaps more reliable method of arriving at actual needs is to estimate the daily admissions to sick report requiring treatment in fixed hospitals, and then consider that figure in connection with the number of days each patient so admitted will occupy a bed. In various studies—based on experience tables—the following factors have been proposed:
1. For the *Zone of the Interior* assume that 2 per each 1,000 of total strength will be admitted to sick report, require treatment in a fixed bed, and occupy same for 50 days; that of all those admitted 3% will remain indefinitely, and produce an accumulation which must be gradually provided for.
2. For the *Theater of Operations* assume that 3½ per 1000 of total strength

will be admitted to sick report, require treatment in a fixed bed, and occupy same for 60 days; that of all those admitted 5% will remain indefinitely, and produce an accumulation to be gradually provided for. For reasons which are obvious the flat percentage system seems much more popular.

In defensive operations on the various borders of the United States only 20% of the fixed hospitalization allowed a theater of operations need be actually established therein; 80% may be located in the Zone of the Interior.

In operations outside of the continental limits of the United States, particularly in oversea expeditions, the full allowance of fixed hospitalization should accompany such expeditions for establishment in a Theater of Operations. Part (1/3) of the hospitalization allowance allotted to the Zone of the Interior is utilized in the establishment of *general hospitals* to function under the control of The Surgeon General.

The station hospitals provided under these allowances function under the control of the various corps area commanders.

Upon the advent of combat activities the amount of additional hospitalization, in the form of general hospitals to be established in the Zone of the Interior, will depend solely upon the duration and magnitude of operations, the number of accumulated casualties therefrom, and such policies as may be adopted with reference to the disposition of those who become permanently disabled. For example, existing *U. S. Veterans Bureau* hospitals, or additional ones established by that bureau, may plan to take over for rehabilitation all patients permanently unfit.

During the mobilization period temporary station hospitals will be established whenever necessary and those now in existence will be expanded to maximum capacity. These activities will be conducted largely by corps area staffs.

On M-Day The Surgeon General will expand to maximum capacity the existing general hospitals (Fig. 6—for an example of wartime expansion) and as soon as possible will proceed with the establishment and operation of additional general hospitals at important points throughout the country. These general hospitals will be considered as available for the hospitalization of all nearby troops and will be utilized during the mobilization period in lieu of establishing additional station hospitals at or near the same place.

About 27 of these new general hospitals, from the Organized Reserve, will be established in the Zone of the Interior as speedily as possible after M-Day, and followed by others, later on, according to the requirements then to be met.

As regards hospitals wherever established the utilization of existing buildings with such necessary alterations, additions and repairs as will render them suitable for use as hospitals, will as far as practicable take precedence over new construction. For *emergency expansion* provision will be made for sufficient open space around all hospitals on which to erect tentage or equivalent temporary structures for increasing their capacity.

In order that hospitalization facilities may be used to maximum advantage all *hospital trains* of the Zone of the Interior will function under the direct control of The Surgeon General and he will utilize these trains in distributing patients to the various hospitals, and from one hospital to another as the necessity arises. An adequate *ambulance service* will be assigned to each hospital.

Local mobilization somewhat complicates the hospitalization problem, as cases of sickness and injury requiring treatment will arise at places where hospitals are not immediately available. Under such circumstances, if a member of the unit cannot properly be treated in his home, accommodations for him in the nearest available hospital must be sought by the medical officer or by the local civilian physician in attendance on the case. Whenever necessary, military personnel will be admitted to civil hospitals. Every effort should be made, however, to send the patient to the nearest military hospital, provided that the distance it not too great and that he will not be harmed by the amount of extra travel involved.

Distribution of Units. Upon mobilization and when ready to function, units pertaining to the Medical Service (veterinary excluded) normally will be distributed as shown in the following table:

War Department	*Zone of the Interior*		Medical Detachments Station Hospitals General Hospitals Hospital Trains Corps Area Laboratories Medical Supply Depots Medical Department Schools Medical Department Replacement Center
	Theater of Operations	*Combat Zone* (G. H. Q. Reserve included)	Medical Detachments Medical Regiments (Armies, Corps, Divisions) Medical Squadrons (Cavalry Divisions) Surgical Hospitals Evacuation Hospitals Convalescent Hospitals Army Medical Laboratories Army Medical Supply Depots Aviation Medical Laboratories Auxiliary Surgical Groups
		Communications Zone	Medical Detachments Station Hospitals General Hospitals Hospital Centers Hospital Trains General Dispensaries General Medical Laboratory C. Z. Medical Laboratories Aviation Medical Laboratories C. Z. Medical Supply Depots Medical Department Concentration Center Hospital Ships

Resources of Other Government Agencies. As mentioned above, the amount of hospitalization to be established by the Army in the Zone of the Interior after meeting the needs incident to mobilization and routine transfers from the Theater of Operations, depends to some extent upon existing or potential facilities that may become available through the activities of other government agencies. Three of these, briefly reviewed below, maintain in time of peace a Medical and Hospital Service which merits more than passing consideration when planning for definitive military hospitalization in time of war.

The Navy. While the Navy, through its Bureau of Medicine and Surgery headed by a Surgeon General, maintains various hospitals and dispensaries throughout the country, practically no assistance in the way of hospitalization can be expected from that source, because the Navy must prosecute war jointly with the Army and will have troubles of its own in expanding its existing facilities in order to meet the increased demands of the Naval Service. The role of the Navy in the overseas evacuation of patients, especially as regards provision for hospital ships, is described in Chapter V. What might be termed the "land force" of the Navy—The Marine Corps—is organized much after the fashion of our Army units. These Marine Corps contingents have a field medical service patterned after our medical regiment and medical squadron, an arrangement which will greatly facilitate medical administration, evacuation, and supply whenever these forces are brigaded or divisioned with the Army.

The Public Health Service. This Service, which functions under the Treasury Department and is presided over by a Surgeon General, also maintains in time of peace hospitals which will have to be expanded in time of war to meet the additional demands created by enlargement of our Merchant Marine activities, and probably on that score alone will be taxed to capacity. However, from a national defense viewpoint, it must be remembered that the Public Health Service is an outstanding asset in war, as well as in peace, because it keeps a very close touch on the pulse of the Nation and is continually doing much in the field of preventive medicine towards minimizing communicable diseases among our manpower. With the means they have at hand for gathering information on Public Health matters the officials of this Service will be able to nip in their very incipiency many outbreaks of communicable diseases among the men awaiting a call to the colors. In addition to operating quarantine stations, this Service also takes an active interest in the development and work of the Departments of Health of the various states. It has direct control over water supplies used for drinking and culinary purposes on railroads, vessels, and other interstate carriers. It is also a leader in the fight against the spread of venereal diseases. Through its Hygienic Laboratory it regulates the standardization and sale of viruses, serums, toxins, and analogous products. For example, the quality of all the anti-tetanic serum to be used by the Army and produced by domestic firms is supervised by this Laboratory.

The Veterans Bureau. As regards hospitalization this Bureau offers the largest and most important resource available to the Army, as well as to the Navy.

The United States Veterans Bureau, an outgrowth of the World War, is a permanent agency, the facilities of which will undoubtedly have to be considered in drawing up military hospitalization projects for the Zone of the Interior in any wars of the future. Because of its existence, and the facilities it offers, the Army will be able to "process" its patients much more rapidly than has hitherto been possible, and transfer to the care of the Veterans Bureau many cases classified as permanently unfit for further military service and in need of rehabilitation before they can resume their civil pursuits. This will materially reduce in Army hospitals the demand for beds resulting from the so-called accumulative factor. In short, when the peak of a war has been reached the Army need construct additional hospitals only after all Veterans Bureau accommodations are being fully utilized.

The headquarters of the Veterans Bureau is located in Washington, D. C. Since 1921 it has functioned as an independent Bureau, under the immediate control of the President. It is in charge of a Director, and has a well-organized medical service.

In 1927, at advantageous points throughout the country, it is operating 54 regional offices, 54 dispensaries for out-patient service, 2 general supply depots, and 51 hospitals. Of the Veterans Bureau hospitals, the smallest has 85 beds and the largest 984 beds; the total beds now available in them being approximately 21,000. In time of war it is quite probable that these hospitals alone, with temporary structures erected around the permanent plant, could easily provide for double that number of patients, thus relieving the Army and Navy of the necessity of providing 20 or more general hospitals.

At present the Veterans Bureau hospitals, which are well staffed and administered, are classified in 3 categories: (1) general medical and surgical, (2) tuberculosis, and (3) neuro-psychiatric. Approximately 13,000 personnel are permanently employed in these hospitals, among which are about 800 professional men and executives, and about 1400 nurses.

Furthermore, in a war of any magnitude, and looking to the needs of the future as a result of such a war, the Veterans Bureau would undoubtedly build many new hospitals which could be constructed during the period of hostilities, in lieu of military hospitals, as the result of joint conferences between the various departments concerned.

CHAPTER V

MEDICAL SERVICE IN THE FIELD

Introduction. In this chapter the author has resorted to a narrative style of discussion, in an effort to unfold a connected story that will hold the attention of the reader and perhaps give him a clearer picture of our field activities, in which there are so many ramifications.

Where any large number of men are to be employed on a given task, their organization into suitable groups is essential to the accomplishment of satisfactory results. A machine on a firm foundation must be created, each part working in harmony with the others and all dominated by a single will. No more complete and intricate machine exists than that found in a modern army, and that part relating to the administration of the Medical Department is one of great and essential importance. Until recently this point had been too often overlooked.

Our experience in past wars has clearly demonstrated that zeal and patriotism cannot make up for defective organization and absence of team work. It is comparatively easy for the doctor to care for wounded actually under his hands. But the problem in war is to bring together the wounded man, the surgeon, and the necessary supplies and shelter in a suitable way, without unduly interfering with combat activities.

Not all these facilities can be brought up to the wounded under the limitations of war. Therefore the problem of medical field work, before becoming one of a purely professional nature, resolves itself first of all into one of *transportation of patients.*

Excepting those slightly wounded, who ordinarily are hospitalized in formations near the front until they can be returned to duty on the line, a soldier who falls *in action* usually is destined to receive final treatment in a general hospital, sometimes hundreds of miles to the rear, at the very moment he is picked up, given first aid, and placed on a litter.

In getting back he is always under the watchful eyes of the Medical Department, whose work consists first in *making* and second in *keeping* him transportable as he passes through the successive hospital echelons, (Fig. 10) or relay stations as they might properly be termed, which become more commodious and complete as the rear is approached. Depending upon the way in which he is bearing up under the injury he may bridge the gap in a day or two, or on the other hand, a month may elapse before he reaches the haven of a comfortable bed in a busy general hospital far removed from the boom of the big guns at the front.

Our entire scheme of organization is devised upon the principle that the disabled must be sent as quickly as possible to a point in the rear where they will not embarrass the fighting force and yet upon recovery can be

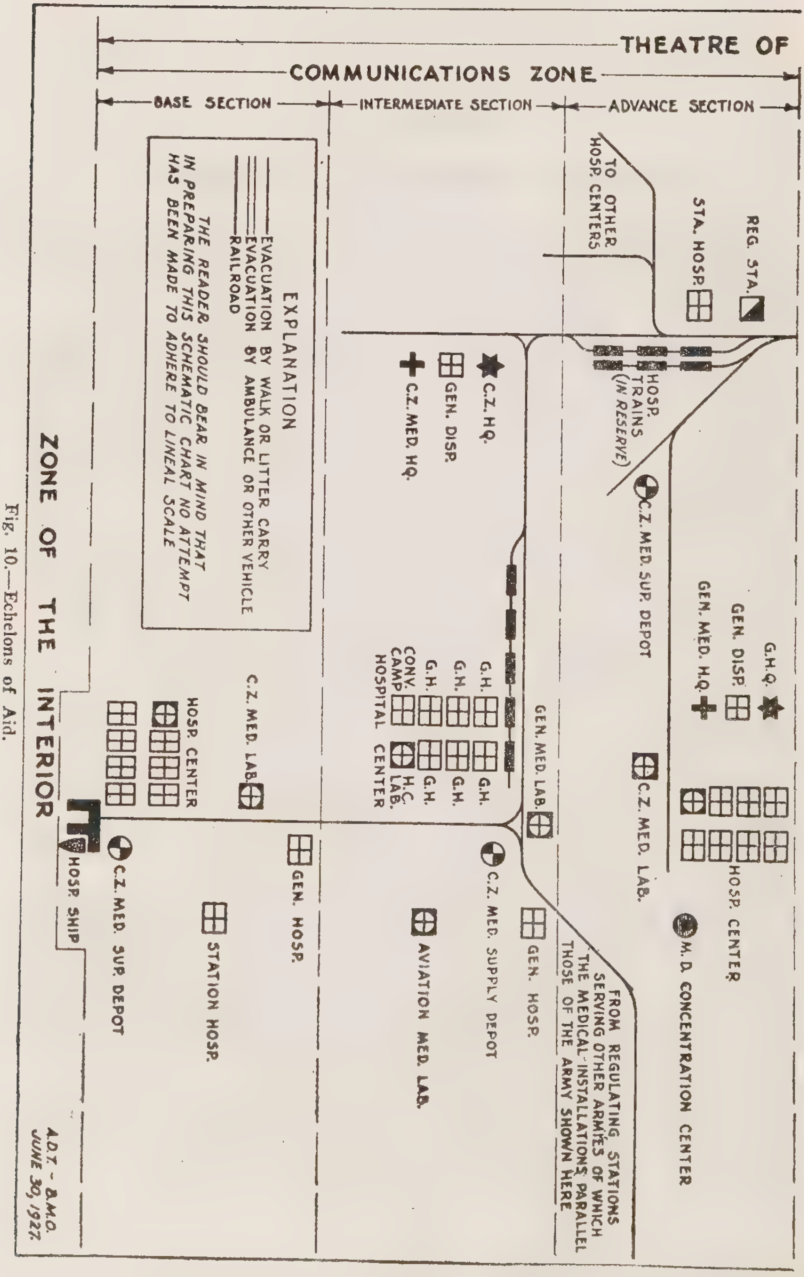
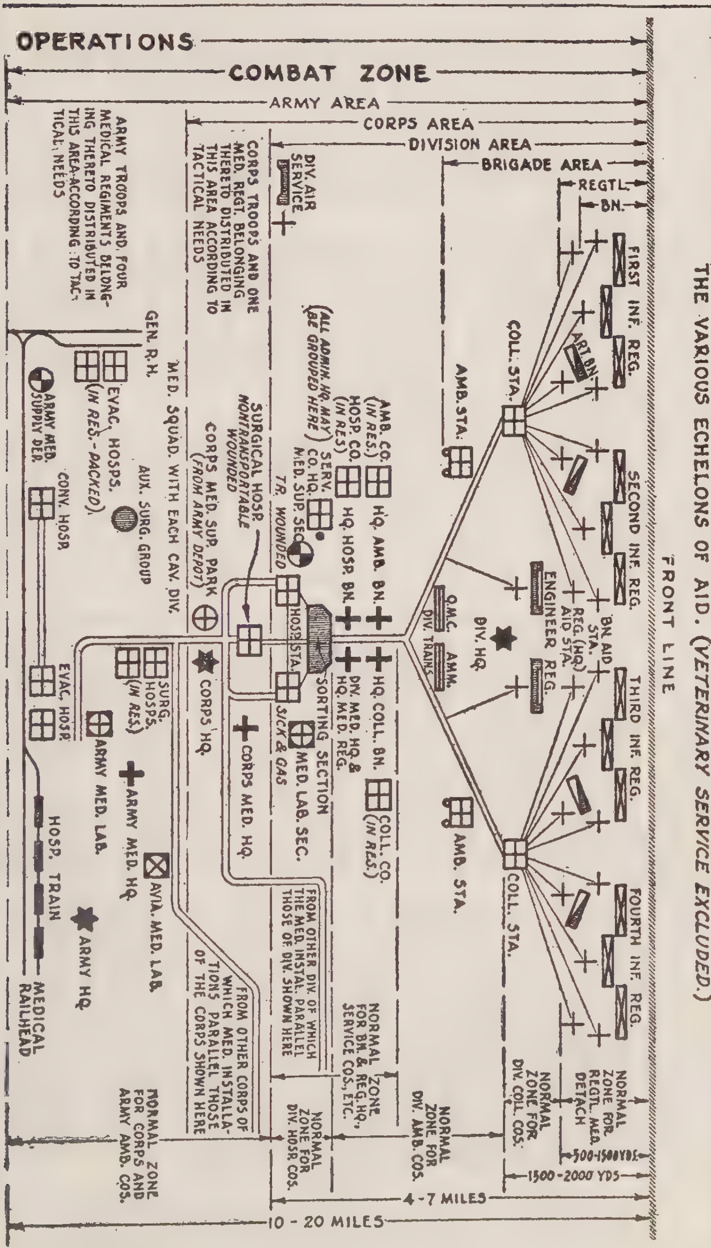


Fig. 10.—Echelons of Aid.


FRONT LINE
OPERATIONS
COMBAT ZONE
ARMY AREA
CORPS AREA
DIVISION AREA
BRIGADE AREA
REGTL.
BN.
FIRST INF. REG.
SECOND INF. REG.
THIRD INF. REG.
FOURTH INF. REG.
ART. BN.
ENGINEER REG.
BN. AID STA.
REG. (HQ) AID STA.
COLL. STA.
COLL. STA.
AMB. STA.
AMB. STA.
DIV. HQ
Q.M.C.
AMM.
DIV. TRAINS
DIV. AIR SERVICE
AMB. CO. (IN RES.)
HOSP. CO. (IN RES)
HQ. AMB. BN.
HQ. HOSP. BN.
(ALL ADMIN. HQ. MAY BE GROUPED HERE)
SERV. CO. HQ.
MED. SUP. SEC.
HQ. COLL. BN.
COLL. CO. (IN RES.)
DIV. MED. HQ & HQ. MED. REG.
TR. WOUNDED
HOSP. STA.
SORTING SECTION
SICK & GAS
MED. LAB. SEC.
SURGICAL HOSP. NONTRANSPORTABLE WOUNDED
CORPS MED. SUP. PARK (FROM ARMY DEPOT)
CORPS HQ.
CORPS MED. HQ.
CORPS TROOPS AND ONE MED. REGT. BELONGING THERETO DISTRIBUTED IN THIS AREA ACCORDING TO TACTICAL NEEDS
MED. SQUAD. WITH EACH CAV. DIV.
AUX. SURG. GROUP
SURG. HOSPS. (IN RES.)
ARMY MED. LAB.
ARMY MED. HQ
AVIA. MED. LAB.
ARMY HQ
GEN. R.H.
EVAC. HOSPS. (IN RES.-PACKED).
ARMY MED. SUPPLY DEP.
CONV. HOSP.
EVAC. HOSP.
HOSP. TRAIN
MEDICAL RAILHEAD
ARMY TROOPS AND FOUR MEDICAL REGIMENTS BELONGING THERETO DISTRIBUTED IN THIS AREA ACCORDING TO TACTICAL NEEDS
FROM OTHER DIV. OF WHICH THE MED. INSTAL. PARALLEL THOSE OF DIV. SHOWN HERE
FROM OTHER CORPS OF WHICH MED. INSTALLATIONS PARALLEL THOSE OF THE CORPS SHOWN HERE
NORMAL ZONE FOR REGTL. MED. DETACH
NORMAL ZONE FOR DIV. COLL. COS.
NORMAL ZONE FOR DIV. AMB. COS.
NORMAL ZONE FOR BN. & REG. HQ., SERVICE COS., ETC.
NORMAL ZONE FOR DIV. HOSP. COS.
NORMAL ZONE FOR CORPS AND ARMY AMB. COS.
500-1500 YDS.
1500-2000 YDS
4-7 MILES
10-20 MILES

MEDICAL DEPARTMENT ACTIVITIES IN A THEATRE OF OPERATIONS

SCHEMATIC REPRESENTATION EXHIBITING FRONT TO REAR DISTRIBUTION OF UNITS EMPLOYED IN ESTABLISHING THE VARIOUS ECHELONS OF AID. (*VETERINARY SERVICE EXCLUDED.*)

returned without unnecessary delay to the front. In order to prevent a sick or wounded man going any farther to the rear than is absolutely necessary, special provisions exist at every hospital echelon for picking out those who can be returned to duty within a few days.

In order that all the demands made upon a special service may be met and efficient administration assured, the personnel allotted to the various services composing the military body must be grouped, on the team-work principle, into what we usually characterize as units, such as companies, regiments, divisions, hospitals, etc.

This is accomplished through the preparation of what is known as a Table of Organization covering every unit officially recognized in the Army. Medical Department units are identified by a single series of numbers for each type, beginning with 1. The data appearing in the table (Fig. 11) published in this chapter have been abstracted from Medical Department Tables of Organization. These tables prescribe specifically the grades and number of personnel to be employed in each unit.

Only a decade ago we emerged from a *World War* in which the organization of the Medical Department as previously prescribed was put to a severe test. While found to be fairly satisfactory, defects in it were noted from time to time during the progress of the war and whenever possible were immediately corrected. It must be admitted, however, that in so extensive a conflict we learned many lessons from which profit can be had. Since then the Medical Department has been reorganized as a result of our experiences in that war.

While the principles of war and of the employment of the medical service in the field remain the same in every campaign, each war presents problems peculiar to itself and differing from those of preceding wars. It is impracticable, therefore, to lay down hard and fast rules which can be applied to every campaign. While we have embodied herein the experience gained during our last war, we must always be prepared to modify our organization and methods so as to adapt them to the military situation and local conditions appertaining to any particular campaign.

To those familiar with the organization of the Medical Department existing prior to the World War the addition of new agencies or elements in the relay system from front to rear and many changes in names and functions will be noted.

Through legislation enacted in 1916 the Veterinary Service of the Army was incorporated as part of the Medical Department. In this chapter no effort will be made to describe the units that pertain to nor the functions of that service, even though in the field it does constitute a very important agency of the Medical Department. Suffice it to say, however, that in the care of animals the facilities provided for preventive medicine, evacuation, and hospitalization parallel and are somewhat analogous to those instituted for men. The salvage of men and animals is therefore a direct charge upon the Medical Department and is conducted by the *Medical Service* and the *Veterinary Service* working side by side under one administrative head—the chief surgeon of the field forces.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		PERSONNEL						TRANSPORTATION								NORMAL ALLOWANCE					
For Details Consult Table of Organization:	Title of Unit.	Officers	Nurses	Warrant Officers	Enlisted Men	Total	Patient Bed Capacity	Animals	Ambulances	Kitchens Trailer or Rolling	Wagons	Cars, motor	Motorcycles	Trailers Water Tank	Trucks, motor	Number per Infantry Div.	Number per Cavalry Div.	Number per Corps (3 Divisions)	Number per Army (3 Corps)	Number per G.H.Q.Reserve	Total number per Theatre of Oper.
61W	Medical Regiment	60		1	882	943	750	149	60	7	5	8	14	7	72	1		4	16		96
23W	Medical Detachment Infantry Regiment	11			84	95		29			4		1			4					-
182W	Hdq.Corps Medical Service	11			16	27												1	3		18
282W	" Army " "	25	2		57	84						5	4						1		6
283W	Evacuation Hospital	40	60		300	400	750			2		1	2	2	5				12	12	84
284W	Surgical Hospital	20	20		110	150	250			1		1	1	1	3				10	6	66
285W	Convalescent Hospital	21			180	201	3000		4			1	2		3				1		6
286W	Medical Laboratory, Army or C.Z.	8			32	40						1	2		3				1		12
287W	Medical Supply Depot,Army or C.Z.	12			218	230						1	2		4				1		18
489W	Medical Squadron	13			207	220	125	211	20		10		5		7		1		2		12
677W	General Dispensary	10			30	40			1			1	1								6
678W	Hdq. Med.Service, C.Z.	26	2		92	120						2	1								1
679W	Medical Laboratory, Aviation	6			24	30						1			1				1	6	18
680W	Medical Laboratory, General	25			100	125						1	6		2						1
681W	Medical Dept.Concentration Center	13			110	123			6			3	5		20						1
682W	Hospital Train	4	6		40	50	300														36
683W	General Hospital	42	120		400	562	1000		6			1	1		4						300
684W	Station Hospital, C.Z.	15	35		150	200	250		4			1	1		3						180
688W	Hospital Center(Gen.Hosp.not incl.)	46	2	1	342	391	3000-20000		20			4	9		2						24
689W	Auxiliary Surgical Group	483	282		535	1300			12			9	6		3						6
None	Office of Chief Surg.G.H.Q.(estimated	64	6	2	200	272															1

Fig. 11.—Table Showing Composition of the Various Field Units of the Medical Department Utilized Within a Theater of Operations, for a Force Comprising Six (6) Field Armies, Veterinary Units of the Army and C. Z. not included. (From War Strength Tables of Organization, Series of 1926-1927).

In order that the student who consults a reference work of this character may be able to visualize the composition of a medical service in the field each unit employed is briefly described below. No attempt has been made to set forth in detail the internal administration of the various hospitals mentioned. Limitation of space precludes this. Wherever seemingly necessary, special emphasis has been laid upon those features of field work with which the average reader would not be familiar, and on which he would probably seek enlightenment.

As a war measure the Medical Department is particularly concerned with broad considerations of the man-power of the *Nation;* her most important material resource; her only defense in time of war. The medical profession at large must accept responsibility for the conservation of the health of the national man power. This can only be accomplished through civilian channels in peace and by the Medical Departments of the Army and Navy in war.

Upon the declaration of war, the resources in man power become available for the defense of the nation through *mobilization.* Mobilization may be defined as collecting physically fit men and assembling them, properly equipped, into military units in readiness for war. The speed of mobilization must be such as to produce men organized into units fast enough to meet the demands of the military situation, if the success of the forces in the field is not to be jeopardized. The method of mobilization must rest upon a sound medical basis, otherwise the casualties from disease, incident to bringing together large numbers of individuals, will destroy the effectiveness of the system.

After victory has been secured there remains the tremendous problem of *demobilization.* Here it is the duty of the Medical Department to determine the physical condition of each officer and soldier to be discharged. This examination indicates whether further physical reconstruction is possible, enables the Government to protect itself against unjust compensation claims, and at the same time assures a pensionable record for those entitled thereto.

It also becomes the duty of the Medical Department to provide for the reconstruction of soldiers physically disabled, where improvement is possible, and the care of all other sick and disabled until such times as they can be turned over to other governmental agencies.

During peace it is of vital importance to analyze periodically the physical qualifications of our man-power that we may know the number now physically able to perform combat duties, and indicate the means by which this number can be increased in the years to come beyond what can be expected due merely to the natural growth of the population.

An analysis of the World War statistics shows that—

(1) Of the men legally qualified (Class 1) approximately 25 per cent will be rejected or assigned to limited service because of physical defects.

(2) About one-half of all men examined have physical defects which are remediable.

(3) The weeding out process causes a serious delay in the speed of mobilization. Unless corrective measures are instituted the time may come when our national existence will be jeopardized by this condition of physical unfitness and the consequent inability to mobilize our man-power more rapidly for defense. The problem is one primarily of *public health* work to prevent the development of these defects, and secondarily of medico-military efficiency to increase the speed of induction. Medical men whether in civil or military life are vitally concerned in the solution of these problems.

Administration of the Medical Service. The administration of the Medical Department in a theatre of operations is under the direct supervision and control of a representative of the Surgeon General who bears the title of *Chief Surgeon.* He maintains an office of record either at the general headquarters of the field forces or at the headquarters of the communications zone, as may be directed by the commanding general of the forces.

He has a number of technical assistants distributed throughout the administrative ramifications of the entire theatre. Wherever military *"staffs"* are maintained an officer of the Medical Corps serves thereon in an advisory capacity, coordinating and supervising the activities of the Medical Department within the jurisdiction of the staff on which he is serving.

With the general staff at general headquarters and at headquarters of the communications zone the chief surgeon of the field forces will usually be represented by one or more medical officers, who while so serving may be detailed as members of the General Staff Corps.

If the chief surgeon does not personally establish his office at the headquarters of the communications zone, a zone surgeon is assigned there to represent him. If the communications zone is extensive and has been subdivided into various sections to simplify administration and particularly supply, a *section surgeon* is designated for each section so established.

Each hospital center is administered by a medical officer, with suitable staff, who commands all the units comprising it.

In the combat zone we find with each *army* an army surgeon, each *corps* a corps surgeon, each *division* a division surgeon, each *regiment* a regimental surgeon, and each *battalion* a battalion surgeon.

The army surgeon is the coordinator of all the Medical Department activities in his army, supervising the work of the corps and division surgeons under him. It must be remembered that there is also a very important aggregation of special troops, known as army troops, which require his attention. Among these army troops he has at his disposal 4 medical regiments, which constitute an important part of his reserve resources.

In the corps troops, and under the control of the corps surgeon, there is 1 medical regiment. The Corps Surgeon exercises general supervision over the entire medical service in his area. This supervision includes the divisions in his corps. He is in frequent conference with division surgeons and assists them in their problems.

At the headquarters of the medical regiment we find the commanding officer directing the administrative affairs of his regiment and at the same time acting in an advisory capacity as surgeon on the staff of his commanding general. To direct and coordinate the activities of the companies comprising the various battalions we have a commanding officer and headquarters for each collecting battalion, ambulance battalion, and hospital battalion.

The scheme of administrative organization of the Medical Department in a theatre of operations is shown graphically in Fig. 12.

The Medical Detachment with an Infantry Regiment. The Medical Department formations found in an infantry division are the detachments attached directly to and serving exclusively the various combat units to which they are assigned, and a medical regiment, practically in echelon behind those detachments, to cover the general needs of the entire division. The division (Fig. 4), is an aggregation in round numbers of about 20,000 officers and men, and 7,000 animals. A division marching in a single column on one road occupies nearly 28 miles of road space.

While only the medical detachment of an infantry regiment is discussed it must be remembered that all other units of the Army, be they regiments or independent organizations of smaller size, are given a definite allowance of Medical Department officers and men, whose functions, while so attached, are normally limited to the organizations with which they are serving.

This detachment is under the control of the regimental surgeon. In combat the regimental surgeon is confronted with the definite task of rendering first aid to the troops on the line, of establishing *Aid Stations* where the wounded may be assembled and temporarily cared for, pending their evacuation to the rear by other agencies. When not in the presence of the enemy he establishes *Dispensaries* for and supervises the sanitation of his regiment. Ordinarily the medical service personnel is subdivided into a section for each of the 3 battalions and for the headquarters of the regiment. The members of each of these sections are then designated for service in establishing aid stations, or as litter bearers, or as first aid men. The latter, of which normally 2 are assigned to each company in line, follow their organization into battle, maintaining close contact with it throughout the action, and personally render or supervise the application of first aid to the wounded as they fall. The battalion surgeon coordinates the activities of his battalion section from the aid station established by him.

During combat the principal duties devolving upon a medical detachment with an infantry regiment are to render *first aid* to the wounded on the battle field, to establish an aid station behind each battalion and at the headquarters or command post of the regiment, known respectively as battalion and regimental aid stations, to remove or direct the wounded to such stations, to direct the trivially wounded back to the firing line from such stations, to direct to the collecting station or other designated station in the rear other slightly wounded able to walk, and to tag with the emergency medical tag all casualties handled by it.

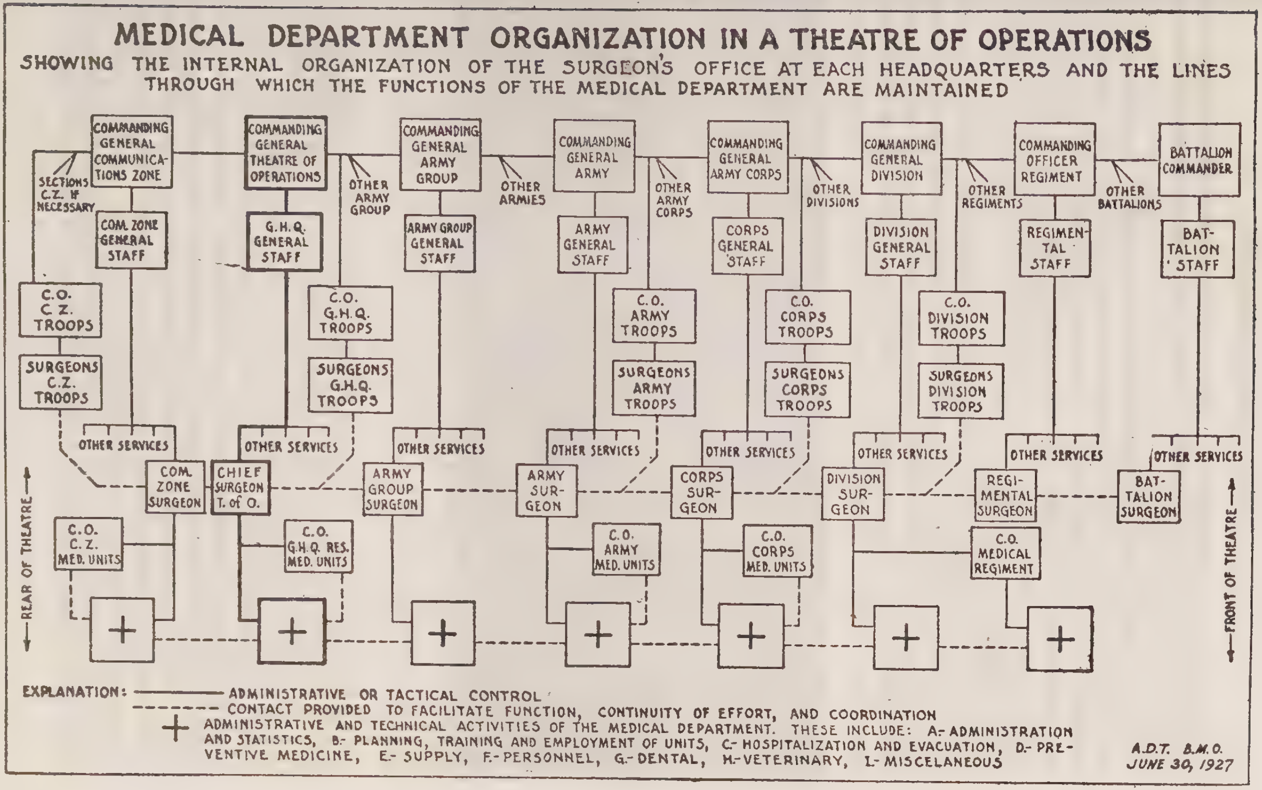

MEDICAL DEPARTMENT ORGANIZATION IN A THEATRE OF OPERATIONS
SHOWING THE INTERNAL ORGANIZATION OF THE SURGEON'S OFFICE AT EACH HEADQUARTERS AND THE LINES THROUGH WHICH THE FUNCTIONS OF THE MEDICAL DEPARTMENT ARE MAINTAINED
COMMANDING GENERAL COMMUNICATIONS ZONE
SECTIONS C.Z. IF NECESSARY
COM. ZONE GENERAL STAFF
C.O. C.Z. TROOPS
SURGEONS C.Z. TROOPS
OTHER SERVICES
COM. ZONE SURGEON
C.O. C.Z. MED. UNITS
COMMANDING GENERAL THEATRE OF OPERATIONS
G.H.Q. GENERAL STAFF
OTHER ARMY GROUP
C.O. G.H.Q. TROOPS
SURGEONS G.H.Q. TROOPS
OTHER SERVICES
CHIEF SURGEON T. of O.
C.O. G.H.Q. RES. MED. UNITS
COMMANDING GENERAL ARMY GROUP
ARMY GROUP GENERAL STAFF
OTHER SERVICES
ARMY GROUP SURGEON
OTHER ARMIES
COMMANDING GENERAL ARMY
ARMY GENERAL STAFF
OTHER ARMY CORPS
C.O. ARMY TROOPS
SURGEONS ARMY TROOPS
OTHER SERVICES
ARMY SURGEON
C.O. ARMY MED. UNITS
COMMANDING GENERAL ARMY CORPS
CORPS GENERAL STAFF
OTHER DIVISIONS
C.O. CORPS TROOPS
SURGEONS CORPS TROOPS
OTHER SERVICES
CORPS SURGEON
C.O. CORPS MED. UNITS
COMMANDING GENERAL DIVISION
DIVISION GENERAL STAFF
OTHER REGIMENTS
C.O. DIVISION TROOPS
SURGEONS DIVISION TROOPS
OTHER SERVICES
DIVISION SURGEON
C.O. MEDICAL REGIMENT
COMMANDING OFFICER REGIMENT
REGIMENTAL STAFF
OTHER BATTALIONS
OTHER SERVICES
REGIMENTAL SURGEON
BATTALION COMMANDER
BATTALION STAFF
OTHER SERVICES
BATTALION SURGEON
+
REAR OF THEATRE
FRONT OF THEATRE
EXPLANATION:
ADMINISTRATIVE OR TACTICAL CONTROL
CONTACT PROVIDED TO FACILITATE FUNCTION, CONTINUITY OF EFFORT, AND COORDINATION
+ ADMINISTRATIVE AND TECHNICAL ACTIVITIES OF THE MEDICAL DEPARTMENT. THESE INCLUDE: A- ADMINISTRATION AND STATISTICS, B- PLANNING, TRAINING AND EMPLOYMENT OF UNITS, C- HOSPITALIZATION AND EVACUATION, D- PREVENTIVE MEDICINE, E- SUPPLY, F- PERSONNEL, G- DENTAL, H- VETERINARY, I- MISCELANEOUS
A.D.T. B.M.O.
JUNE 30, 1927

Fig. 12.

Ordinarily, the responsibility of the regimental medical service, as far as transportation to the rear is concerned, ceases upon getting its patients to the aid stations.

Supplies used in battle are the first aid packet carried by every officer and soldier, the dressings, instruments, etc., carried in the kits on the person of the Medical Department personnel, and a considerable assortment of surgical and other supplies, weighing approximately 1500 pounds, carried on the escort wagon (Fig. 177) or animal-drawn ambulance (Fig. 17), which transports each aid station equipment. This equipment is designated as a Field Medical Outfit.

So long as a regiment advances its Medical Department personnel moves along with it, treating helpless wounded where they are hit and not pausing longer than to give first aid. But as soon as the advance is checked and the number of accumulated wounded becomes so considerable as to require it, the *aid stations are established.* (Figs. 13 and 14.)

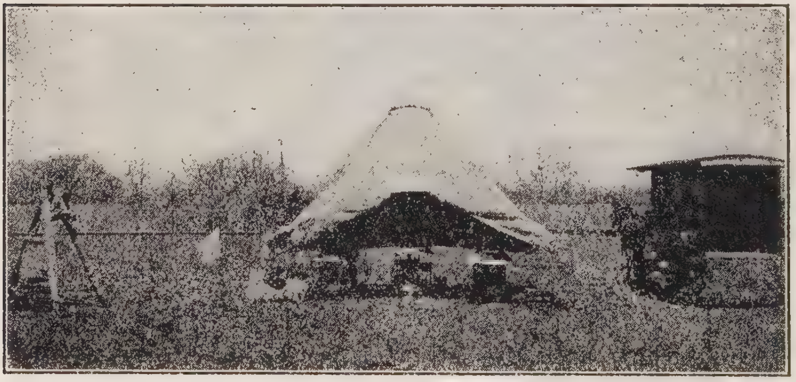


Fig. 13. An Aid Station (or Dispensary) as normally set up. All the equipment shown is transported on the floor of the new pattern animal drawn ambulance on the right. See Fig. 17.

The first consideration in establishing an aid station is protection from enemy fire, and usually the nearer the aid station is to the actual front, the safer it is from dropping projectiles. Long distance artillery fire, as well as the activities of airplanes, has greatly increased the difficulties of securing suitable protection. Subterranean recesses such as caves, cellars of demolished houses, dugouts of abandoned trenches, etc. are frequently sought out and used by aid station parties. In gassed areas these must be avoided.

The aid given on the firing line, in advance of an aid station, consists of the arrest of hemorrhage, the application of an occlusive dressing, and the immobilization of fractures whenever practicable.

The treatment at an aid station will usually be limited to first aid for wounded coming from the front who have not already received it; and to the readjustment of dressings, if necessary, of those who have. Fractures, if not previously immobilized, are here put in splints. Antitetanic serum is administered. Restoratives and analgesics, particularly morphine, are given as required. Stimulating food and drink are furnished. As far as possible the treatment or prevention of *shock* must be instituted at once.

The treatment rendered is carefully noted on the E. M. T.; especially the time and dose when morphine is given. If a tourniquet has been applied the fact and time are also noted. A word of warning is necessary as regards the administration of morphine in cases suffering from collapse. Such patients may have had injections of morphine previously, but owing to their condition the drug has failed to produce any effect. It is wise to withhold further doses of morphine until some recovery from shock has taken place under the influence of warmth, when it will often be found that the dose previously administered will induce the desired sleep.

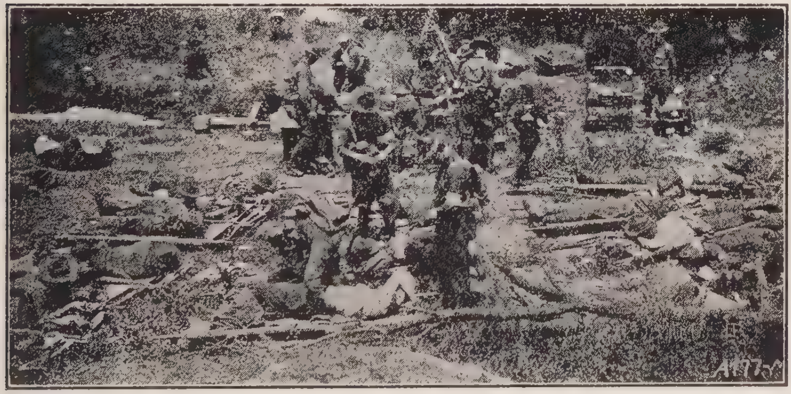


Fig. 14. An Aid Station at the Front. Same equipment as Fig. 13, pyramidal tent not being used.

Briefly, the aid station must make and keep the wounded man *transportable*. As a rule, *no operations* are performed in an aid station, except those urgently needed to save life, such as the ligation of an artery or the performance of a tracheotomy. It must be remembered that further to the rear are better facilities with greater chance for successful surgical work.

The medical officer in charge of an aid station must not permit it to become over-crowded. All able to walk should be started back promptly to the next relief point (collecting station) in the evacuation chain, which has in the meantime been established to the rear. Those unable to walk are turned over to members of the litter-bearer section of the collecting station as soon as they arrive.

A system of *liaison* or *contact* is always maintained between an aid station and a collecting station in its rear and immediately reestablished whenever broken.

If the infantry regiment moves, the aid stations are evacuated, closed, and moved forward, never getting out of touch with the organizations to which they pertain. Otherwise an advance might leave an aid station so far behind that it would not be able to fulfill its mission.

As previously emphasized, it is the duty of collecting station parties from the rear to evacuate all aid stations. From the foregoing it will be seen that the first phase of medical work is done on the firing line and at the aid stations.

The volume of *casualties* developing in a very short time will sometimes be tremendous. This creates a necessity for husbanding a small reserve, even among the personnel allocated to the limited regimental detachment, that can be thrown in at the right time where most needed. Losses do not fall equally on all organizations. Some may be shot to pieces, while others may scarcely lose a man. At times regiments have lost half their strength in a single battle.

The complete *Training Regulation* (405-40) on the Regimental Medical Detachment appears in Chapter X.

The Medical Regiment of an Infantry Division. The medical regiment was created as a result of our experience in the World War. (It replaces what was formerly known as the sanitary train.)

It consists of a regimental headquarters, 1 service company, 1 collecting battalion, 1 ambulance battalion, 1 hospital battalion, and 1 veterinary company; aggregating a personnel of 60 officers and 882 enlisted men.

The *collecting battalion* consists of a headquarters and 3 collecting companies, the *hospital battalion* of a headquarters and 3 hospital companies, and the *ambulance battalion* of a headquarters, 1 ambulance company, animal drawn, and 2 ambulance companies, motor.

The regiment, part of the forces of the division commander, is under the immediate command of a colonel of the Medical Corps, who also serves as *division surgeon*. Thus, in his dual capacity, the commander of the medical regiment coordinates the entire medical work in the division from the division surgeon's office, usually allocating the actual administration of his regiment to his *"executive officer"* or *"second in command"*—the lieutenant colonel.

The Collecting Company. The collecting company establishes a *Collecting Station* to which it transports patients as they are assembled at the battalion and regimental aid stations. Walking wounded are directed to collecting stations.

Normally it should not be necessary to establish more than one collecting station for each infantry brigade in action. With only two such brigades this would leave 1 collecting company of the medical regiment always in reserve for emergency or relief purposes.

The *equipment* provided a collecting station is designed to afford some shelter, and sufficient material for emergency dressings, splinting, treatment of shock, etc. This equipment is carried on motor trucks. It consists chiefly of an abundance of dressings, a set of instruments for emergency operations, medicines, foods, blankets, etc. In connection with their principal function of collecting the sick and wounded of the mobile forces and preparing them for transportation to the hospital stations in the rear, an important part of their equipment are the litters and litter-carriers, a considerable supply of the former being provided.

A collecting company ordered into action proceeds about as follows: The company as a whole goes to a point towards the front which is sheltered from fire, and from which it can best serve the interests of the brigade it is to evacuate. Here the collecting station section of the company locates near a water point in a protected spot, preferably one near good roads leading to the rear so that ambulances may easily reach it. If dugouts or buildings are not available tentage provided in the equipment is used as shelter for the dressing theatre (Fig. 15). While the collecting station is being established the litter-bearer sections of the collecting company move forward across the field of action and get into touch with the aid stations established on the sector of the line they have ordered to evacuate.

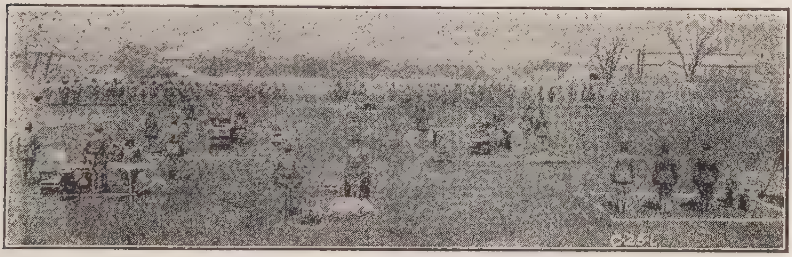


Fig. 15. The Personnel and Equipment of a Collecting Company in position preparatory to erecting tentage and establishing Collecting Station. Note outline of spaces for tents, and litter bearer sections ready to move forward.

As soon as contact with these aid stations is effected they start the flow of wounded to the collecting station, a variable distance, perhaps half a mile or a mile, to the rear.

Nearly all of this work of removing the wounded that have been assembled in aid stations, must be accomplished through the use of the *hand litters* or *wheeled litter-carriers.* Rarely is it possible for ambulances to negotiate direct contact with an aid station, owing to the state of the terrain, which is shell-torn, mined, or obstructed by convoys consisting of artillery, ammunition, supply, kitchen, and other vehicles pertaining to the troops in line and attempting solely to move forward and maintain contact with their units.

The time when collecting companies go into action is synchronized with the activities of the brigade or brigades they are designated to evacuate.

For purposes of identification a collecting station must be suitably marked with a *Red Cross* guidon for friendly walkers and a Red Cross ground marker for enemy airmen. Markers must be put up along the road to direct litter squads, ambulances, and walking wounded to it.

The collecting station itself is usually divided into a receiving and forwarding section, a slightly wounded section, a seriously wounded section, a pharmacy, kitchen, and mortuary.

Within 10 or 15 minutes after being ordered to establish, its stores should be unpacked, the kitchen in operation and ready to supply liquid nourishment, and the dressing theatre ready for the reception of patients.

All wounded, irrespective of the severity of their injuries, should pass through the receiving section. The trivially injured, after treatment, are returned to their organizations without delay. Those disabled for fighting, but able to walk, are usually organized into squads and sent to the hospital station farther to the rear, either afoot or in trucks or other vehicles bound in that direction. Seldom should ambulances be used to transport patients of this character, they being reserved for the use of more severely wounded. Wounded not able to walk, particularly the desperately wounded, are held in their proper department of the collecting station pending their evacuation by ambulances to the hospital station. All wounded who have not been previously tagged should receive emergency medical tags here.

A great proportion of the work done in a collecting station is bandaging and the rearrangement or replacement of first aid dressings applied at the front, to the end that wounds may have an occlusive dressing. The immobilization of fractures and of extensive lacerated wounds should receive special attention.

Only such operations will ordinarily be performed here as are imperatively demanded to save life or permit further transportation. In fact the primary function of a collecting station is to insure *rapid but safe evacuation.* Every effort must be made to keep up a steady flow of wounded to the rear, avoiding undue accumulation in the collecting station. The treatment and prevention of shock is of paramount importance.

Prominent in the mind of every worker at a collecting station must be the question, *"How soon can this patient be transported without seriously jeopardizing his chances of recovery?"*

The collecting station must remain in operation as long as casualties are occurring on its sector or until one of the collecting companies held in reserve is pushed forward and establishes another collecting station in advance of and to supplant it.

When not in action collecting companies constitute a very important reserve for a Division Surgeon and are given general utility assignments under his direction. In training and rest areas they may be utilized in supervising and carrying out general measures of sanitation.

When the division is on the march collecting companies establish *"march collecting posts"* to care for and evacuate sick and injured cases arising while en route.

Collecting stations established by collecting companies are evacuated through *Ambulance Stations* established by *Ambulance Companies.*

The Ambulance Company. The efficiency of expeditious evacuation in the combat zone rests primarily upon the ambulance companies. In carrying on their important function they are employed as units and in taking their places in the evacuation chain establish *Ambulance Stations.*

These ambulance stations, established by ambulance companies at the most convenient point on a good road, as near the collecting station which they are evacuating as conditions and safety will permit, are not places intended for the assembly or treatment of patients, as are collecting stations and the hospital stations.

Normally an ambulance station is situated about midway between the collecting station and the hospital station.

It is from the ambulance station that all movements of ambulances from front to rear, and vice versa, are regulated.

Twenty (20) ambulances are assigned to each company. Upon establishing a station, from 2 to 4 ambulances are immediately dispatched up the road to remain in a position of readiness at or near the collecting station. The other ambulances remain in a position of rest at the point designated for the ambulance station.

As soon as patients in the collecting station are fit for evacuation and the ambulances can take to the road with safety, they leave singly or in pairs, conforming to such *convoy rules* as may be in force. As each loaded ambulance on its way to the hospital station passes the ambulance station, another empty ambulance from the ambulance station is dispatched at once to the collecting station to replace it. When the loaded ambulances have deposited their patients at the hospital station they do not return to the collecting station, but take their place in line at the ambulance station and await their turn for further movement to the front. This briefly describes the cycle and illustrates what we mean by the *"shuttle system,"* the *"regulating system,"* or the *"control system,"* employed in administering an ambulance service at the front.

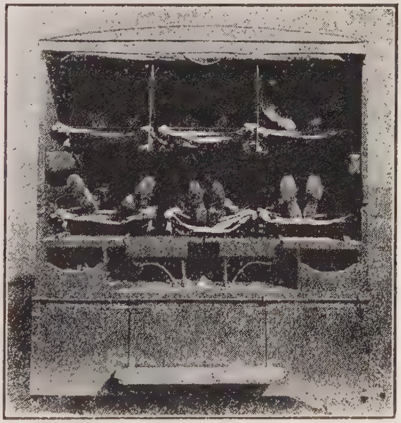


Fig. 16.—Rear View of Heavy Ambulance, loaded with six patients on litters. For side view see Fig. 7.

The number of ambulances above given as being always at the collecting station varies, of course, according to conditions under which they are operated. If the ambulance station representative at the collecting station finds that it is practicable to employ ambulances in advance of the collecting station and thus relieve the the litter-bearer section of the collecting station of its heavy burden of transporting patients by hand or wheeled litter, he orders out for this purpose the ambulance always available at the collecting station, and requests that an additional allotment of ambulances from the ambulance station be forwarded to him at once. Points where ambulances in the shuttle system are placed to receive patients are known as *"Ambulance Loading Posts,"* and points where empty ambulances are held to move up to the next post to replace an ambulance dispatched to the rear are known as *"Ambulance Relay Posts."*

An ambulance station requires *no equipment* other than that carried in the jockey box of each vehicle and such other articles as may be carried loose in the ambulance, such as blankets and splints to meet ordinary emergencies while transporting patients.

It will be noted that 2 of the ambulance companies of a division are motorized and the other animal drawn. Two types of motor ambulances are employed. The *heavy* accommodates 6 patients lying on litters (Fig. 16), and the *light* 4 patients. Both carry 8 patients sitting.

The animal-drawn ambulances are provided to cover the needs whenever it is impracticable to employ motorized vehicles. Hauled by 4 mules they are able to negotiate terrain that frequently cannot be traversed by motor vehicles. The old-pattern ambulance has a capacity for 4 patients lying and 8 sitting. The new-pattern accommodates the same number lying, but can carry 12 sitting, and in addition, on the floor of its body, under the seats for "sitters," a complete field medical outfit for an aid station. (Fig. 17).

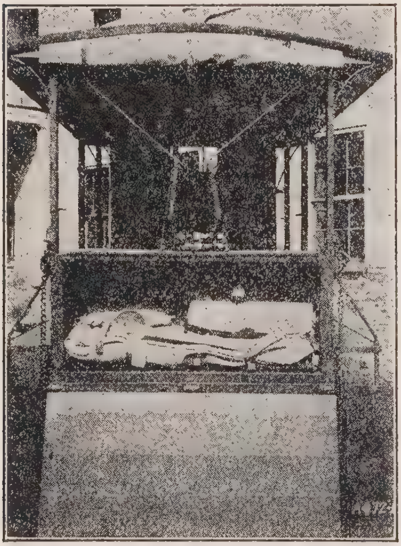


Fig. 17.—Rear View of Animal-drawn Ambulance, New Pattern. Field Medical Outfit on the floor of body. Sides arranged for sitters; 6 on each side. For another view see Fig. 13.

Animal-drawn ambulances are also able to follow marching troops and take care of march casualties much more economically than a motorized vehicle. They are particularly needed in evacuating aid stations established by the personnel with artillery regiments.

The Hospital Company. A hospital company establishes a *Hospital Station.* As there are 3 hospital companies in each medical regiment it will be seen that 3 hospital stations may be established.

In keeping with the military axiom that one should at no time exhaust all his resources, usually one company is held in reserve and only 2 are set up for operation as hospital stations.

The function of a hospital station is to receive all sick and wounded, including "gassed cases," flowing in from the front and then to sort, temporarily shelter, care for, and promptly evacuate them to the rear.

The hospital station is the converging point in the evacuation relay within the divisional area. Ordinarily they are the installations farthest to the rear to which divisional medical personnel go, save when the surgical hospital is established only a short distance from the divisional group. It is the function of agencies in the rear, under the direction of the army or corps surgeon, to evacuate hospital stations.

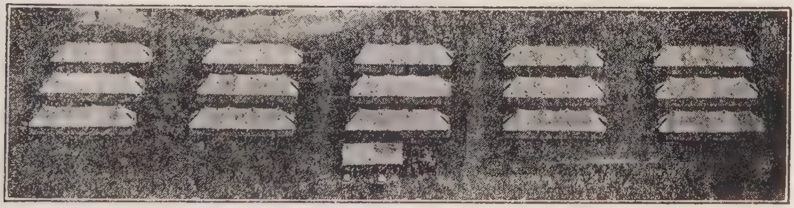


Fig. 18. The normal lay-out of a hospital station, established by one hospital company. (Airplane view).

Whenever possible hospital stations should be grouped in one place. One hospital company should be held in reserve and 2 established *"at station,"* 1 being designated to receive *transportable wounded,* and the other one *sick and gassed,* and also on occasions walking wounded, if the first mentioned station is being overtaxed as to capacity.

Prior to a battle the hospital companies with their equipment packed on vehicles will have been assembled at some suitable point awaiting the order to move forward. The place where and time at which they are to establish hospital stations is indicated in the orders of the day.

Hospital stations should be established at a point far enough from the front line as to be reasonably safe from enemy shell-fire. Ordinarily this will be from 5 to 6 miles from the actual front. They should be plainly marked with the Red Cross and should not be placed near an important cross-road, ammunition dump, or artillery position.

In order to avoid interference with traffic it is better to place them on a side road rather than on a main road. In either case a cut-out should be constructed so that ambulances will not stop on the road, but will be directed into the cut-out.

Hospital stations cannot be established with the idea of wholly escaping the shelling incidental to raking of the back areas. If it can be secured, shelter in buildings is most advantageous. If such form of shelter is not available tentage (Fig. 18) must be utilized.

While it has a common-sense application to all medical formations from front to rear, *sorting* or *triage* is one of the most important functions devolving upon a hospital station. The term *"triage,"* taken from the French, may be used either as a verb or a noun. During the World War it gained a firm foothold in Medical Department nomenclature. If for no other reason than this it requires a brief description. With particular reference to the sick and wounded it may mean either "sorting" or a "sorting point." Its objects are two-fold: 1st, conservation of man-power; 2nd, the conservation of the interests of the sick and wounded.

The fighting forces must not be permitted to suffer any depletion in strength due to avoidable causes. Accordingly, at the entrance to a hospital station or group of hospital stations, is the receiving section which is designated as the *triage,* or *sorting* section. Through it passes the stream of wounded, sick, gassed, and nervous cases, coming in from the front. Here, before further disposition, the patients are examined and classified by the orthopedic, gas, and neuro-psychiatric consultants attached to the division surgeon's staff. In this primary sorting, separation of the severe from the slight cases is accomplished.

The latter, among which may be included malingerers, are held and returned to their units on the line; thus directly conserving the strength of the combat forces. For example, in the American Expeditionary Forces during the World War, over 65 per cent of all the so-called cases of "shell-shock" who reached the triage at the hospital station were not permitted evacuation beyond that point, being held there for 24 hours or less for a rest and again returned to the line, capable of performing full duty. To a lesser extent, similar results were achieved by careful sorting of the slightly wounded.

Non-transportable cases must be held, operated upon, and temporarily hospitalized in the surgical hospital that has been designated to receive this class of severely wounded patients from the particular divisional area involved. To reduce the carry, the surgical hospital has been pushed forward as far as possible and is established preferably adjoining the hospital station group to carry on this important life-saving work.

If classified as transportable, the patient is evacuated to a formation (evacuation hospital) in the rear for primary surgical attention. Even upon arrival at the evacuation hospital he is again subjected to a "*hospital* triage," to the end that he may be admitted to a special department or ward of the hospital best fitted to care for the particular type of wound (or illness, as the case may be) from which he is suffering.

All wounded (gas cases included) are classified as follows: (a) walking, (b) transportable lying, (c) transportable sitting, (d) non-transportable.

All sick are divided into two disease classifications, (e) communicable, (f) noncommunicable.

As a matter of general principle no hospital station should be found harboring sick, wounded, or gassed cases who are unable to withstand transportation to the rear should an emergency evacuation become necessary. The proper place for such cases is the surgical hospital.

When an order to move forward is received the surgical hospital established in connection with the group by the army or corps surgeon is not involved in that order, and remains at its location, caring for all the non-transportable cases until they can be safely disposed of.

Every opportunity to move to the rear cases unable to walk, but who can stand transportation, should be seized. Any wounded able to walk should be started to the rear at once, either in groups afoot or by means of empty transportation vehicles returning to the rear for supplies, etc., of which in any large action there is always a goodly number. As wounded are brought in from the front by the ambulance companies other wounded are being prepared for evacuation to the rear. Unless every effort is made to this end, the hospital station would ultimately become choked with wounded.

Heretofore it had been customary to designate separate from the hospital station group a so-called "station for slightly wounded." Its purpose was to relieve dressing stations and field hospitals (old nomenclature, now called collecting stations and hospital stations,) of the slightly wounded who required little attention, were able to walk, and by virtue of the latter fact arrived early at relief points and congested them to the disadvantage of others more in need of comprehensive treatment. With the reorganization effected as a result of our experiences during the World War the establishment of these stations outside the hospital station group is prohibited, although the advantages of designating a certain portion of the group for the assembly of walking wounded is clearly recognized. Under the old scheme of organization there was a necessity for this provision in view of the fact that the former field hospital was required to receive and care for the severely wounded, or what are commonly knows as "*non-transportables.*" Now that the division components have been relieved of this responsibility through the adoption of the surgical hospital *all* wounded in the divisional area should be concentrated in the hospital stations for sorting (triage) and suitable distribution. Moreover, World War experience taught us that the term "slightly wounded" was misleading. It early devoloped that the slightly wounded required considerable attention if they were to remain in that category, and that wounds offering prospects of speedy repair should be sorted, cared for, and disposed of along with all other cases flowing in from the front, and follow identically the same channels of evacuation, observation, and treatment.

The equipment of a hospital company for the purpose of establishing a hospital station is as complete as the character of the work they are designed to carry on and the necessity for mobility will permit. Stripped as it is of all refinements there are still some able medical officers who regard this equipment as somewhat too elaborate for the limited work it will ordinarily be expected to perform. Every concession has been made to reduce weight and promote portability. Its 15 light hospital tents provide shelter and treatment space for 250 patients. (Fig. 18). As regards the use of tentage remember that in wet weather care should be taken to insure that nothing touches the inside of a tent; otherwise the rain will drip through. With rain ahead or in places where heavy dew is common always slacken the ropes to avoid pulling out of tent-pins when the rope shrinks. As the ropes dry out tighten them again.

Hospital stations established by hospital companies are evacuated to *evacuation hospitals* by *Ambulance Companies* detailed for that purpose from corps or army troops.

The Service Company. This company carries on both administrative and technical functions.

It has its own headquarters and sections which provide the clerical personnel for *regimental headquarters* and each *battalion headquarters* and in addition a *band section,* a *general supply section,* a *medical laboratory section,* and a *medical supply section.*

The regimental headquarters section coordinates, supervises, and directs the general administration of the Medical Regiment. It is the point where the field orders are prepared and from which they are distributed.

In addition to its normal duties the band section may be employed for general utility purposes during an emergency, and thus constitute an appreciable reserve.

The general supply section is charged with maintaining the general supply (not medical) of all units of the medical regiment. The officer in charge of the general supply section is particularly concerned with the coordination and supervision of the procurement and distribution of such supplies as rations, forage, clothing, gasoline, etc., needed not only by the personnel belonging to the medical regiment but for the patients being handled by it. He is directly responsible for the maintenance of utilities—the serviceability of all means of transportation, and animals, belonging to the medical regiment. All requisitions are viséd by him. He establishes a regimental distributing point for the supplies handled by him.

The functions of the medical laboratory section and medical supply section of the service company are described below.

The Surgical Hospital. This is a new type of unit, a legacy from the World War, evolved in order to provide for the class of battle casualties known as *non-transportable wounded.* (When first adopted during our operations overseas it was designated as a Mobile Hospital and retained that name throughout the war.)

These units were designed in order that a well-equipped and standardized surgical hospital, capable of being easily transported and providing facilities for competent and immediate surgical aid of an expert character to the seriously wounded, might be brought to the patient close to the battle line, instead of removing any chance of recovery that the non-transportable man might have by conveying him an uncertain distance to another hospital in the rear.

Prior to its adoption the care of non-transportable wounded devolved upon one of the *field* hospitals of the Division. This immediately immobilized the divisional unit harboring these cases and violated the basic principle that all the constituents of a Division must retain their mobility at all times and at all costs.

The surgical hospital is essentially *mobile,* the entire equipment being transported on trucks. It is independent of rail facilities. Its primary role is surgical aid, hence its name. It has a normal capacity for 250 patients. The operating features provide modern facilities for the continuous employment of at least nine *surgical teams,* with all the necessary X-ray, lighting, sterilizing, and other appurtenances.

Surgical hospitals are Army units, their distribution being under the general control of the army surgeon, but their actual assignment and location in the support of a division in action is usually allocated to the *corps surgeon* under whose immediate supervision they function. The *Surgical Consultant* of the corps supervises and coordinates the surgical work performed in these hospitals. To each division on the line is assigned at least one of these units. It will be noted that ten are allocated to each army. This allowance permits of holding a few in reserve at all times, and instances will arise whereby two of these surgical hospitals may be working side by side caring for the more seriously wounded of one division. As a division is sent into the line of battle one of these hospitals is turned over to the corps surgeon, who designates a location for it after consulting the plans of the Division Surgeon. Whenever practicable it should be established alongside or immediately in rear of the hospital station of the division it is to serve.

The hospital spreads its canvas and prepares for the reception of patients coincident with the setting up of hospital stations at the beginning of the engagement. Upon arriving at the sorting section established at the hospital station, all the more seriously injured are immediately sent to the surgical hospital instead of into the wards of the hospital station. If the surgical hospital is not alongside, where carriage by hand-litter or wheeled-litter will be practicable, the patients upon arriving at the triage are seldom removed from the ambulance in which they arrive, but are dispatched in it direct to the surgical hospital. Throughout the engagement and while the division is in line the surgical hospital continues to receive patients. Owing to the character of the cases being admitted by it a surgical hospital thus becomes temporarily immobilized. This does not mean, however, that the patients are retained there indefinitely. As soon as a patient has been operated on and his condition will permit, steady evacuation to evacuation hospitals in the rear is conducted by the surgical hospital just as it is in the case of all other forward establishments.

If the division keeps advancing and it becomes necessary to evacuate the hospital stations of the patients temporarily being cared for by them, in order that they may close, move forward, and reestablish, perhaps five miles further to the front, the surgical hospital remains in its old location and another surgical hospital is turned over to the corps surgeon by the army to proceed forward and establish near the division in its new location. Except for a few stray cases coming in from the front this practically arrests further admissions to the first surgical hospital. It remains at its old location until all its patients can be evacuated to the rear with safety. This may mean a matter of only a few days or on the other hand, two weeks. When it has accomplished this mission it either goes into reserve for a well-merited rest, or if the stress at the front is again pressing, it may be sent forward to replace some other surgical hospital which has been immobilized, or to serve a new division going into the line.

The Evacuation Hospital. Upon these hospitals falls the brunt of the preliminary care of battle casualties. They are the keystone of hospitalization in the combat zone.

Prior to and even during the early period of the World War they were classed as units pertaining to the lines of communication (now called Communications Zone). This assignment proved unsatisfactory and they were placed under *army* control.

Evacuation hospitals are virtually the neck of the funnel through which all casualties coming in from the front must pass in their dispersion to the rear. In them *triage* or *sorting* becomes particularly important.

Like all other medical formations, the evacuation hospital is intended to facilitate the further transport to the rear of serious cases liable to be permanently incapacitated, or those calling for more protracted treatment than the nature of such an establishment is intended to provide. On the other hand it will retain all cases offering prospect of early recovery and return them to duty, usually through the convalescent hospital, with their organizations at the front. Every effort is made here, as elsewhere, to prevent wounded soldiers from being separated from their commands longer than is absolutely necessary. Provision is made for temporary and even definitive treatment of certain selected patients whom it is inadvisable to send further to the rear.

Even during times of greatest activity there will always be found in an evacuation hospital a certain number of cases that cannot be evacuated to a general hospital without endangering their lives. About 10 per cent of all the wounded cases flowing in from the front are so badly injured that they cease to be a military asset. As soon as they have been operated on and are fit for transportation, a steady stream of them is constantly sent rearwards to the general hospitals, with the homeland as their ultimate objective. Taking average conditions, 20 per cent will never leave the combat zone, being temporarily hospitalized in the evacuation hospital or convalescent hospital until they are fit for return to duty on the line. The balance will require evacuation out of the combat zone, to general hospitals in the communications zone for definitive treatment with a view to their return to a combat status. Upon the evacuation hospital, therefore, devolves a very important military duty in conserving the fighting strength of the

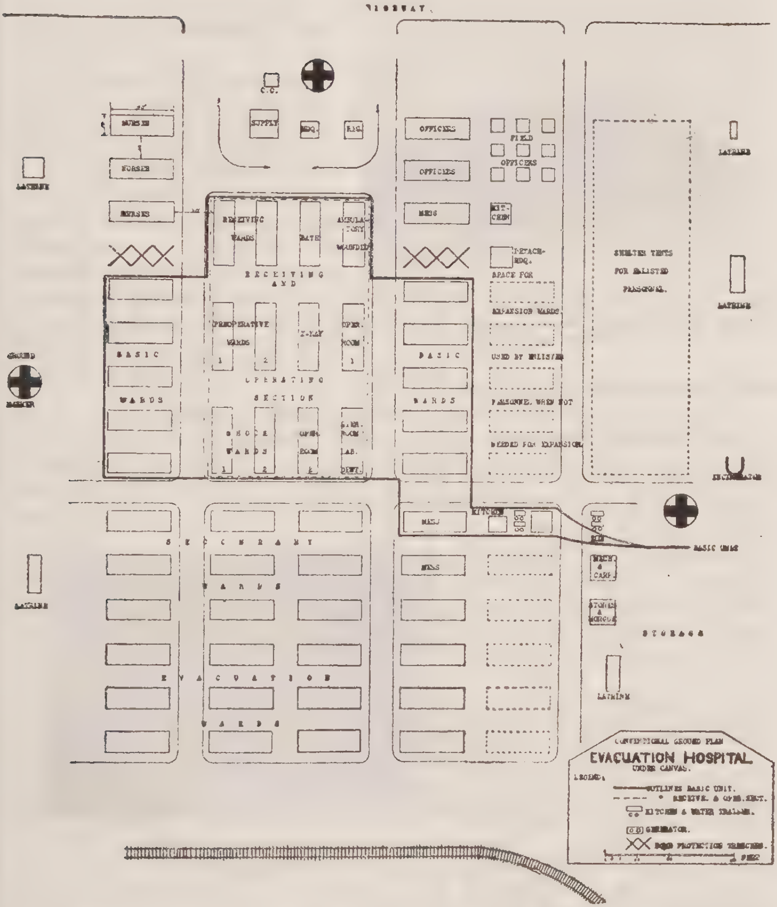


Fig. 19.—Conventional Ground Plan of an Evacuation Hospital under Canvas.

commands at the front. From an humanitarian standpoint, it has also been characterized as *"the pivot upon which the man's life, limb, and future usefulness turn."*

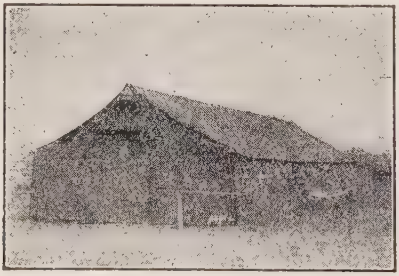


Fig. 20.—Type of Heavy Hospital Tent Used in Basic Section of an Evacuation Hospital, in Surgical Hospitals, and for Emergency Expansion in Hospital Centers.

A great mass of emergency surgery, and a goodly proportion of the definitive surgery of all battle casualties is performed in this hospital. The character and extent of the surgical treatment given wounded in evacuation hospitals will naturally vary with existing conditions. When the tide of wounded is high the treatment is confined to emergency work and evacuations by hospital trains to the rear are speeded up; on the contrary during periods of calm more extensive and complete treatment is afforded.

If they are to function properly, the *location* of these hospitals is a matter of utmost importance. Their primary function is well indicated by their name. Under normal conditions, and excluding consideration of the seriously and the slightly wounded who are retained in them for reasons already mentioned, evacuation hospitals become merely *relay* or *clearing* stations in the evacuation-hospitalization chain of an army. Accordingly, they must be located on or near standard gauge railroad sidings readily accessible to hospital trains. This facilitates a steady stream of evacuation from them to the general hospitals in the communications zone. During extensive operations the location of evacuation hospitals away from railheads is a *tactical* blunder. Even when troops are moving forward, from a practical standpoint much more efficient results are achieved by retaining an evacuation hospital at the railhead and transporting the wounded even a considerable distance to it, than by separating the hospital from its rail contact and sources of supply and thus necessitating evacuation of *post-operative* cases to railheads by ambulance.

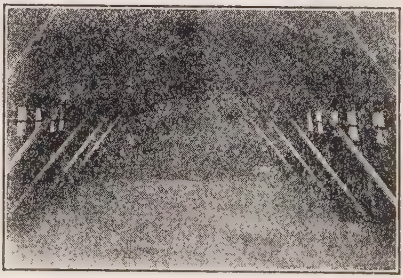


Fig. 21.—Interior of Heavy Hospital Tent Shown in Fig. 20.

So far as available trackage will permit these hospitals should be located as near the front as possible—generally within 10 to 20 miles of it. An evacuation hospital must have an abundance of water, and be on or near good roads leading from the hospital stations and surgical hospitals further toward the front. To avoid the bombing activities of enemy airmen, it is preferable to have it off by itself or in a group with other hospitals, plainly marked with a ground cross that can be seen from the air (Fig. 25).

Each evacuation hospital (Fig. 19) has a normal capacity of 750 beds, but under the stress of emergency they may be expanded to accommodate many more than that, since the nature of their service will frequently result in their establishment in communities where buildings are available, thus adding additional shelter to that provided through the tentage (Figs. 19, 20, 21) with which they are equipped. The receiving section should provide sufficient space to handle large convoys; upwards to 100 patients at a time.

Ordinarily, evacuation hospitals are moved by rail. Occasions will, however, frequently arise when they must be moved by motor transportation. The equipment of an evacuation hospital is quite complete, special provision being made for the care of surgical cases.

While emphasis has been laid on the care of wounded, it must be remembered by the reader that adequate provision is also made for the reception, care, and treatment of the seriously sick.

The patients are brought to these hospitals from the hospital stations or surgical hospitals at the front in ambulances supplied by army or corps surgeons from the medical regiments belonging to their army or corps medical service.

Evacuation hospitals are evacuated by hospital trains. They function under the direct control of the army surgeon. When a battle is imminent he locates a number of them, sufficient to meet normal needs, at or near a railroad, and orders them to open and prepare for the reception of patients. A number are held in reserve to be thrown in back of the line where the most casualties are being sustained, whenever the battle becomes stabilized.

Once established, evacuation hospitals ordinarily are not moved during combat unless the troops have advanced so far that the distance makes it easier to move the institution to the patients than the patients to the institution, or when the natural route of evacuation of wounded no longer passes through them. But at no time should they become separated from their much needed railroad facilities.

Certain evacuation hospitals may be set aside exclusively for the reception of seriously wounded, one for the reception of sick, one for infectious diseases, one for gas cases, etc. However, as far as possible, this is avoided in order that evacuation hospitals may be trained in the general work required of them and care for any type of case sent to them.

Frequently these hospitals are located on or near a railhead siding in pairs, although retaining independence of each other. This permits one of them to fill while the other is resting, and then the opening of the latter and the accommodation of all patients being received at that point, while the former is preparing its patients for evacuation. This arrangement also assures that at least one of the hospitals can remain behind and function while the other is closing and moving forward to a new location.

An evacuation hospital may also be located on a navigable stream, if boats for evacuation to the rear are available.

The Convalescent Hospital. As has been previously emphasized, any sick, wounded, gassed, and exhaustion cases offering the prospect of an early return to combat fitness should not be evacuated outside the combat zone. They must be retained well within the sound of guns, and not be permitted to lose their martial spirit.

Obviously, it seldom would be possible to provide a sufficient number of evacuation hospitals to permit the retention in those hospitals of these cases until they can be restored to a duty status.

Therefore, to conserve transportation resources, to economize on the time necessary to get a man back to his unit on the front, and to prevent the evacuation hospitals from becoming unduly crowded with cases which require little or no treatment, but do require a period of convalescence before they are again fit for duty, a convalescent hospital with a capacity for 3,000 patients is provided for each army.

This hospital functions under the immediate control of the Army Surgeon.

In a true sense of the term they are not hospitals. The patients are organized into companies similar to the infantry company. While tentage is provided to shelter about 1,000 patients, it is intended that a convalescent hospital shall be established in or near villages providing the additional shelter and other facilities necessary. Small towns may be taken over entire for this purpose, the billeting system being employed. They are hospitals in the sense that the majority of the personnel cared for in them are not yet physically fit, and remain under the exclusive control of medical officers.

These units harbor men who have a distinct salvage value. Most of the patients are up and about, rapidly being trained to again take up their combat duties. Except that they are under the watchful eyes of the medical officers who command them, the life they lead during the convalescent period is similar to that of a man in barracks. Ambulant cases only are transferred to this hospital, but for the occasional breakdowns that occur a small dispensary and a few wards are maintained.

A section of the hospital is set aside for the reception and treatment of *venereal cases* in the infective period. These cases are segregated from other patients.

Men with slight or nearly healed wounds, who require only a change of dressing daily, may also be sent to the convalescent hospital and properly cared for in considerable numbers whenever the beds occupied by them in the evacuation hospital are needed by fresh cases coming in from the front.

The medical staff of the hospital should be composed of men of mature judgment and great tact. Welfare and recreation features should be provided. Idleness on the part of the patients should not be tolerated. In effecting physical rehabilitation too much stress should not be laid, however, upon military drills alone, other forms of exercise and games being substituted as a means of promoting the desired physical and mental well-being.

These convalescent hospitals should be located centrally in the combat area, easily accessible to the evacuation hospitals, which are the chief contributors of their patients, and preferably in the proximity of the replacement units through which men are returned to the firing line.

The Medical Squadron of a Cavalry Division. The medical squadron is a new unit, the tables of organization for which were officially approved as of January 1, 1925. It consists of a *headquarters,* 1 *collecting troop,* 1 *ambulance troop,* 1 *hospital troop, and* 1 *veterinary troop;* aggregating a personnel, at war strength, of 13 officers and 207 enlisted men.

Heretofore, the medical service of the cavalry division had been considered faulty, in that it did not provide facilities for the collection and temporary hospitalization of its sick and wounded. For the division, in addition to the medical detachments serving with the various regiments and other units, there had been authorized but 1 ambulance company, animal drawn, and 1 veterinary company. For all other agencies the cavalry division was dependent upon the army medical service. Cavalry divisions are *"army"* units.

All along, the aim of the Medical Department had been to provide an organization comparable to the one authorized for an infantry division, but modified so as to suit the conditions peculiar to cavalry operations. This has now been accomplished through the adoption of the medical squadron.

In devising the tables of organization the differences between the composition and functions of the infantry division and the cavalry division were carefully borne in mind. A cavalry division has only about one-third the strength of an infantry division, and its mission necessitates a much greater degree of mobility.

When one stops to consider the functions of the cavalry division, such as reconnaissance, covering an advance, seizing and holding advance positions until the infantry can take them over, break-throughs and pursuits, filling a gap in a line of battle, making flank attacks, or covering a retreat the difficulties of providing a medical service capable of meeting all contingencies can well be visualized.

It is believed that the medical squadron as now constituted will fill the gap that has heretofore existed in the evacuation service of the cavalry division. The medical squadron will be part and parcel of the division. It will maintain constant contact with it.

When the cavalry division advances on an assigned mission the medical squadron will proceed with it and establish in the axis of advance 1 *collecting station,* 1 *ambulance station,* and 1 *hospital station,* from front to rear. These stations should be established on the best road available in the line of advance and readily accessible from the rear.

In combat, the hospital station should be placed in a position to establish near the *pivot of maneuver* and preferably in the vicinity of the division reserve. The ambulance station and collecting station should be established at convenient points along the line of advance of the maneuvering body. Evacuations from the various aid stations of the regiments on the flanks of the cavalry division should be made *laterally* to this direct artery of evacuation on which these stations are established.

Ordinarily the responsibilities of the cavalry division medical service should cease when the sick and wounded of the division are assembled at the hospital station of the cavalry division.

The duty of establishing surgical and evacuation hospitals in the rear of the cavalry division, and of providing necessary evacuation service to those points devolves, as in the case of the infantry division, directly upon the army medical service.

In order to cope with the character of terrain over which the medical squadron will frequently be called upon to operate, the proportion of animal-drawn to motorized transportation has been equitably divided. To speed up on service, motorized transport should be utilized whenever possible. However, when the use of motorized vehicles proves impracticable it is believed that the animal-drawn transportation provided lends additional surety that the equipment needed by the various stations can be laid down at the most advantageous points selected in the route of evacuation.

The medical squadron is part of the cavalry division and is under the command of a *major*. The *Surgeon* in a cavalry division has the rank of *lieutenant-colonel.* While the division surgeon of a cavalry division coordinates the entire medical work of the division from the division surgeon's office, he is not charged with the immediate command of the medical squadron, as in the case of the division surgeon of an infantry division, who commands the medical regiment as well as serving as division surgeon.

The Hospital Train. Hospital trains are of two types, the *standard* and the *improvised.* In time of emergency any type of train may be utilized for the evacuation of patients, but what we have in mind under this heading is a train set aside for the exclusive transportation of the sick and wounded and which functions under the immediate control of the Medical Department as a distinct unit thereof.

In times of stress, when standard hospital trains are not available in sufficient numbers, troop trains returning to the rear may have their empty coaches filled with the less severely wounded. In the past, arrangements had also been made for the conversion of box cars into carriers for the sick and wounded by installing in them special litter fittings. In the World War, when this scheme was tried out by the Allies, it was found to be impracticable. Definite hospital trains must be provided.

The standard hospital train (Fig. 22) is made up of 16 cars, of which 10 are ward cars exclusively devoted to carrying the sick and wounded and the remaining 6 are given over to administration, messes, pharmacy, operating room, train personnel, stores, etc.

The train has a capacity for 360 patients recumbent, and 720 sitting. In the ward cars, the beds, 36 in number, especially designed, are removable and in cases of necessity can be used as litters. They are capable of being folded against the side of the coach and lowered to the floor. In the double tier arrangement the lower tier may be used as a settee while the top tier is still being used for lying cases. By this arrangement the less seriously wounded are made comfortable and can either sit up or lie down. A so-called "*sitting case*" cannot sit up for a prolonged period and it is necessary to provide a bed which even a sitting case may use some time during a long journey.

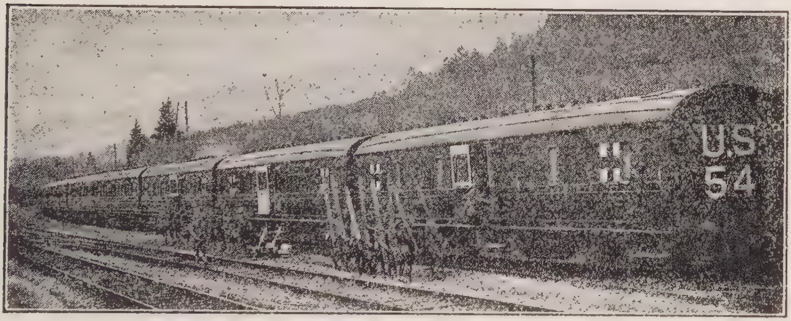


Fig. 22.—The type of Standard Hospital Train Employed by the A. E. F. in France during the World War.

So far as personnel, materiel, supply, and other conveniences are concerned hospital trains of this type are virtually rolling hospitals. They must be vestibuled, which permits of the serving of hot meals and giving surgical attention en route without interruption in transit of the train.

The other type of hospital train employed is one made up of ordinary Pullman or tourist sleeping cars, to which is added a so-called "*unit car.*" In this unit car are the kitchen, pharmacy, operating room, and other facilities needed by patients en route to hospitals. While these trains lack the refinements found in the standard hospital train their use offers certain advantages. With cars of the Pullman or tourist type that can be assembled and released at will all that is necessary to activate them as a hospital train is the one unit car, which remains under the control of the Medical Department. The capacity of these *unit car* trains varies according to the need.

In the rear sections of the communications zone, hospital trains, which either at the front or in the rear, are always under the command of a medical officer, are operated under the direction of the chief surgeon.

In the forward areas of the communications zone and on up into the combat zone an entirely different plan of operation is employed. All movements in and out of the congested areas at the front are coordinated and regulated by an agency of the General Staff known as a *Regulating Station.*

To each regulating station an officer of the Medical Department is assigned as a member of the staff of the regulating officer and as a representative of the chief surgeon. He is given such assistants as may be necessary.

This *medical regulator* practically controls the movements of all hospital trains in the forward areas. Every day the chief surgeon of the field forces allots a requisite number of *vacant beds* in various *hospital centers* to each regulating officer, advising him by telegraph as to their number and location. These beds are then reserved for the exclusive use of the regulating officer to whom they are allotted.

It is the duty of the regulating officer to empty evacuation hospitals at the front of those patients requiring evacuation to the rear. The Army furnishes the regulating officer daily with all data bearing upon evacuations—patients fit for evacuation—in order that the latter can judge the sufficiency of trains and beds at his disposal and take necessary steps to correct a shortage.

Upon receiving advice as to the necessity for evacuating patients from a given hospital at the front, the representative of the chief surgeon at the regulating station, cognizant of available hospital beds in the rear, assigns and indicates a destination for the hospital train.

The commanding officer of the *hospital to be evacuated* is notified by him of the time that the train may be expected, in order that it may be loaded within the time prescribed.

When the train has been loaded and started on its "*march*" the regulating officer from data at hand notifies the commanding officer of the hospital that has been designated *to receive* the patients, of the contents of the train, usually classified as to the number of *officers, soldiers,* and *enemy prisoners,* and in each class the number of *sitting* and *lying* patients, number of *contagious cases* and any other information which would facilitate the unloading of the train and the proper distribution of the patients when they arrive at the hospital center to which they are being evacuated.

The administration of efficient hospital train service in an active combat zone offers many difficulties so far as expeditious travel is concerned. All troop, supply, ammunition, forage, and other trains converge at the regulating station. The daily replacements in terms of personnel and materiel for the fighting forces are stupendous. Beyond the regulating station, and on up into the forward areas, the limited trackage available must be utilized in a very careful and systematic manner, if an absolute tie-up in transportation is to be avoided. In emergencies trains can be dispatched through a regulating station at the rate of 1 every 20 minutes, or as we say, with a density of 72 per day. 24 per day is a good average.

The General Hospital. These are the most important Medical Department formations in the communications zone, and are intended for *definitive treatment.* They are *fixed establishments,* usually remaining at their original location throughout the period of combat operations. They replace what was formerly known as the Base Hospital.

The number employed in the theatre of operations depends upon the proximity of the zone of the interior thereto. If these adjoin—no sea paths separating them—general hospitals are usually placed in the communications zone only at the rate of about 1 per division. Within the hospitalization allowances, in terms of beds, the balance needed and allocated to the theatre of operations is established in territory pertaining to the zone of the interior.

Each hospital has a *normal capacity* of 1,000 beds and is provided with a personnel which in emergencies and by crisis expansion under tentage may care for twice that number of patients if the period of stress is not too prolonged.

General hospitals receive cases by hospital train *direct from the evacuation hospitals* at the front, from other general hospitals making retrograde secondary evacuations, as well as cases originating in the communications zone.

Being completely equipped from a medical and surgical standpoint it is intended that they shall give definitive treatment to the great majority of cases sent to them, forwarding to the zone of the interior (home territory) only such cases as require special treatment or are not likely to be fit for service for a considerable period of time, or will probably be permanently incapacitated for further duty. But when their capacity is being taxed, or an extension of active fighting is in immediate prospect, they must either be evacuated of suitable cases or reenforced by the expansion of accommodations already existing.

No man capable of further duty in the immediate future should ever be sent farther to the rear than a general hospital in the communications zone, for experience amply shows that the services of a great proportion of cases coming into the zone of the interior will probably be lost for the immediate campaign, if not for the entire period of the war.

In locating general hospitals in the communications zone the guiding principle should be establishment on or immediately off the main arteries of railway traffic, and preferably on those radiating from a regulating station serving the forces at the front.

The establishment of a general hospital creates a heavy demand for *shelter.* This is provided either by taking over existing buildings, such as schools, hotels, barracks, industrial plants, and former hospitals, or by new construction. Tentage is rarely used, save for purposes of emergency expansion (Fig. 23).

General hospitals must be *near the troops* they are intended to serve and always accessible to hospital trains. When buildings are taken over for hospital purposes many alterations, additions, and repairs are usually necessary to render them habitable and suitable.

Whenever *temporary construction* on a large scale is undertaken it must be of the simplest type possible. Wooden huts of the portable or barrack type (Fig. 23) are utilized. These are mill fabricated, turned out in sections that can be easily handled and assembled, and a unit building when erected has dimensions approximating 20′ x 100′ x 10′. Wherever local resources will permit, tile, brick, and concrete material is used in lieu of wood. Complete plans for the lay-out of a general hospital are prepared in the Office of the Surgeon General in time of peace so as to be available upon the beginning of combat operations. Whenever it is inadvisable to install an adequate plumbing system, the disposal of fecal matter by means of the pail system and incinerators offers a very satisfactory substitute.

To economize in heating, lighting, and structural material, the buildings are grouped as closely as considerations of fire safety will warrant. In the lay-out of a general hospital unit which has been constructed according to the approved plans with portable or other material, a vacant space is always left at the outer end of each ward for the erection of tentage in emergencies to meet the so-called crisis expansion needs. When this crisis expansion is being employed the more serious cases are retained in the ward proper and the slighter or ambulant cases graduated from day to day into the tented section thereof.

The Hospital Center. The grouping of general hospitals under a unified command, known as a hospital center, offers many advantages. It is economical in Medical Department personnel, greatly simplifies supply and evacuation problems, and facilitates administration.

Under ordinary conditions a typical hospital center comprises about 5 general hospitals providing a normal capacity of 5,000 beds and a crisis or emergency capacity of 10,000 beds. (Fig. 23).

Each hospital center so organized has its own administrative headquarters and special technical troops. The size of the center may, however, vary from 3 to even 20 of these general hospitals.

In the largest centers such activities as the quartermaster and medical depots, laundries, bakeries, motor transport units, power plants, military police, etc., are centralized and under the direct control of the central administrative headquarters.

This system of grouping hospitals was employed during the Civil War, and carried on extensively in France by the American Expeditionary Forces during the World War. For example, from November 11 to December 5, 1918, the Mesves Hospital Center reported a daily capacity of 25,000 beds. On November 16, 1918, this center had a total of 20,186 patients; on November 21, 1918, the number of permanent personnel on duty thereat was 8,642; on November 16, 1918, the total strength of the command at that center, including personnel on duty and patients in hospital, was 28,828—more than the strength of an infantry division at that time.

The grouping of general hospitals in centers of this character permits of a high degree of *unit specialization*; one entire hospital may be set aside for the treatment of gun-shot fractures and other orthopedic cases, another for abdominal cases, one for infectious diseases, one for neuropsychiatric cases, etc.

This intra-center specialization by hospital units also has a very importtant bearing upon the evacuation of patients from the front by hospital train, as a siding to accommodate a full hospital train is provided at all centers.

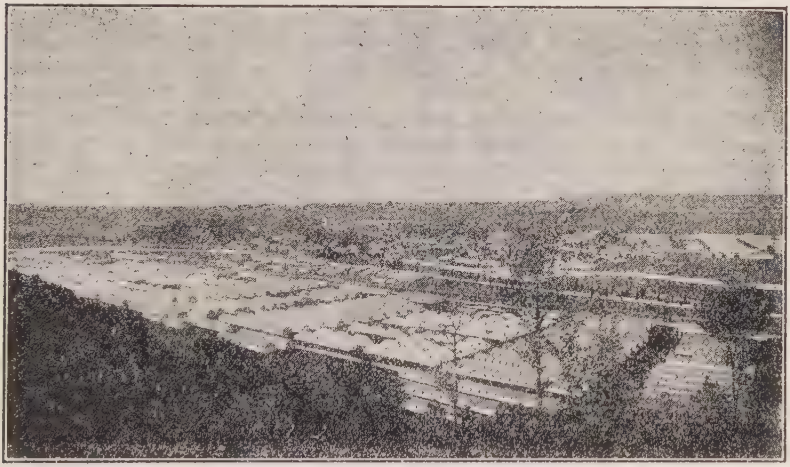


Fig. 23.—Part of the Hospital Center Built by the A. E. F. around the Little Village of Bazoilles-sur-Meuse, France, during the World War. Note that each 1000 bed unit consisted of three rows of buildings, with space alongside for use of tentage as crisis expansion. The normal capacity of this center was 7000 beds. (The hospitals and general layout used in these Centers were of the Author's design.)

The center is organized with all the needed specialties, and can therefore receive a full train-load of patients and distribute them upon arrival to the hospitals best fitted to care for the type of case they represent. This alone takes a great load off the evacuation officer up at the front. In dealing with the bed status of a hospital center all he needs to know is that the vacant beds at that center are sufficient to accommodate his trainload. If dealing with an evacuation to a single general hospital he must first take into consideration the character of cases it is capable of caring for.

Each hospital center has a staff of highly skilled specialists who, in the role of consultants, supervise the work being performed in the different specialties in the various hospitals throughout the center.

Centralization or grouping also promotes team-work, esprit de corps, as well as a spirit of competition, that directly accrue to the benefit of the patient. A new and untried unit taking its place in one of these groups immediately profits by observing the work and learning the methods of a friendly and more experienced neighbor.

Hospital centers are established even when groups of permanent buildings are taken over for hospital purposes. They are better exemplified, however, in the newly constructed centers which spring up in a remarkably short time on virgin fields.

Hospital centers are established only in the communications zone.

The Convalescent Camp. Convalescent camps are provided in the vicinity of and as part of large hospital centers. They are installations to which men not yet fit for duty, but who no longer require hospital treatment, can be sent pending their restoration to full physical fitness.

In these camps convalescent patients are usually sheltered under tents, but sleep on comfortable cots, have an abundance of good food, and are given a certain amount of daily work, drill, and other exercise in order to fit them for subsequent duty at the front.

As to *capacity,* convalescent camps are authorized on a basis of 20% of the total bed capacity of the hospital center with which they are connected.

Aside from the routine requirements of shelter, food, clothing, etc., certain other essential features must be borne in mind in establishing these camps. They must be Medical Department units, commanded by medical officers.

Unquestionably great good is accomplished by removing men who are almost well and face early return to combat duty from the "atmosphere" of a war-time hospital at the earliest possible moment.

The Medical Department officers designated to carry on mental and physical reconstruction of men who have been once subjected to the nervous shock and physical damage wrought by combat cannot be too carefully selected.

Psychological features of reconstruction must be recognized by providing bands and other entertainment features. Good band music and exercise in groups to march music are of first importance in restoring the moral fibre of a man who has been "shaken" by the ordeal of battle. *Irksome* discipline should be eliminated.

Convalescent camps pertain only to the communications zone, and should not be confused with the Convalescent Hospital. The latter is an Army unit.

The Station Hospital. These are 250 bed units provided with personnel and material sufficient to care for *general* medical and surgical cases.

They do not have all the facilities for specialization found in a general hospital. They are fixed establishements designed to meet the local needs of isolated areas. (They replace what was formerly known as the Camp Hospital).

They are established in the communications zone, in divisional training or rest areas, and along the main as well as collateral lines of communication throughout the zone wherever there is sufficient military population to justify their maintenance, and where it would not be in the interest of economy to utilize a general hospital.

Like the general hospital they may be established in existing buildings or provided for in the construction program. In the latter event there is utilized the same type of portable building found in the general hospital in the communications zone.

Station hospitals always function separately, never being grouped. The occasion for the employment of crisis expansion in connection with them, short of an unforseen epidemic, is relatively infrequent. These units are, however, no less important or useful than the general hospital. They fill a great need.

Station hospitals are also utilized in the zone of the interior, in time of peace as well as of war. They vary in capacity from 25 upwards to 1000 or more beds. The normal bed allowance is 5% of the military population they are serving. The zone of the interior station hospitals function under corps area control, except those at independent stations, which function under the control of The Surgeon General.

The Med. Dept. Concentration Center. This is solely a Theatre of Operations unit. It provides the administrative overhead at the place in the theatre selected as the assembly point for *army units* such as evacuation hospitals, surgical hospitals, etc. We operated a concentration center in France during the World War.

The establishment of a center of this character permits units to be prepared for service, and overhauled and refitted at one place when they come off the line, under coordinated control instead of being scattered singly throughout the theatre. This concentration of units at one place also greatly facilitates the solution of supply and replacement problems connected with the replenishing of these units. It also has an important bearing upon the maintenance of discipline.

When evacuation and surgical hospitals or other units are placed in *G. H. Q. Reserve* they should be concentrated at this center until needed.

Hospitals which have been operating on the line for some time should be withdrawn and sent to this center for rest and overhauling. Training of "*green*" units is also carried on at a center of this character.

The Auxiliary Surgical Group. In time of war we cannot be too prodigal in the assignment to any one unit of the limited amount of specialist personnel available. Military hospitals are organized only on a basis to meet the average demands of combat activity. Consequently, occasions will arise where the personnel belonging to a unit cannot hope to cope with conditions created by a large flow of admissions. The need for additional expert help then becomes pressing.

The agency provided to fill this need is known as the Auxiliary Surgical Group.

These auxiliary surgical groups are authorized at the rate of one per army in the field. They are employed either in the Combat Zone or Communications Zone, wherever their services are needed. They contain trained surgeons and other assistants organized into *teams* and are distributed at important points in the Theatre of Operations, ready to respond at a moment's notice to the call of any hospital that is getting behind in its operating schedule. It frequently happens that 20 or more of these teams may be hurried up to an evacuation hospital, to supplement the force of surgeons already on duty there, in order that prompt operative treatment may be assured every patient.

One can well visualize the scene taking place in an evacuation hospital of 750 patient capacity, that is empty on the morning of a battle and is filled to capacity by nightfall. Practically every one of these patients needs an operation of some character. Our aim is to assure that every patient requiring an operation may have it within 24 hours of the time he is wounded. These sudden and great influxes of wounded overwhelm the hospital staff. It is in situations such as this that the Auxiliary Surgical Group plays a very prominent role.

In each surgical group there is an administrative headquarters, 100 *surgical teams,* 25 *splint teams,* 25 *shock teams,* 25 *gas teams,* 25 *maxillofacial teams,* 25 *research teams,* and 25 other teams for miscellaneous assignment.

These teams, as indicated above, have a roving status. They are so mobilized as to permit them to be sent fully equipped for work on short notice to any part of the front or of the rear, in need of assistance. The personnel of these teams are specially selected for their professional attainments. For example, a surgical team consists of one principal operator, one assistant operator, one anaesthetist, one nurse, and one enlisted specialist.

The personnel of these auxiliary surgical groups do not remain idle until emergency calls are received. The commanding officer of the group keeps in close touch with the medical representatives at the various headquarters and the conditions prevailing in the hospitals under their control. He constantly keeps the majority of his teams at work in the field where they can accomplish the most good and retains only a small reserve at his headquarters for any special emergency. The majority of his transfers are made from hospital to hospital.

The administrative headquarters of the group is located at some convenient and central point within the theatre of operations and preferably at the Med. Dept. Concentration Center. The commanding officer of the auxiliary surgical group operates his unit under the immediate direction of the chief surgeon of the field forces, or one of his duly authorized representatives.

The Consultants. For purposes of coordinating, supervising, and supplementing the professional care of sick and wounded in all medical formations within the theatre of operations, highly trained men, consisting almost exclusively of members of the civil medical profession enrolled in the Reserve Corps, who are leaders in their various specialties, are detailed as consultants.

To supervise the work of the two major professional services, a chief consultant of surgical services, and a chief consultant of medical services for the field forces are appointed and function under the direct control of G. H. Q.. Throughout the armies, corps, divisions, and units of the Communications Zone, chief consultants, senior consultants, and consultants, in all the various specialties are also designated and serve as members of the staff of commands to which they are assigned.

Serving with each division, corps, and army is an *orthopedist, urologist,* and *neuro-psychiatrist.* In addition to his other duties the urologist also officiates as Medical Chemical Warfare (Gas) officer.

On the staff of each army medical headquarters there are normally, in addition to the above, one medical consultant and one surgical consultant, with such senior consultants in roentgenology, surgical research, neurological surgery, eye, ear, nose and throat, etc., as may be needed.

At the hospital centers of the Communications Zone, where definitive treatment is carried on, consultants in practically every recognized specialty are assigned. It is the duty of these consultants to see that the most improved methods in each of their specialties are being employed in the commands to which they are attached. They keep a careful watch over the cases coming in, and freely advise and instruct the personnel handling them. They recommend the summary relief of the inefficient, replacing them by properly trained individuals.

The *chief consultants* have an itinerant status. For example, they may be at a hospital center in the Communications Zone one day, investigating the reason for the incidence of a large number of amputations being performed at that place, and a few days later, we may encounter them in a divisional triage or a surgical or evacuation hospital up at the front, seeking out the causes of delayed primary surgical relief (débridement).

The Aviation Medical Laboratory. Aviation Medical Laboratories are attached to the larger aviation centers where men are being trained as fliers.

At work, the unit conducts general physical examinations of the eye, ear, nose, and throat, and makes special examinations of the circulatory, respiratory, and nervous systems to determine the physical condition of fliers.

An aviation medical laboratory is a clearing house for aviators. Without its favorable indorsement no man is permitted to fly. It alone, through its examinations, determines the particular kind of flying duty for which an aviator is most suited. By selecting the most suitable material for flying duty and preventing flights of unsuitable men, as well as *"grounding"* fliers who are temporarily unfit, they prevent much loss of life and valuable property. By detecting physical defects while they are remediable they conserve flying personnel.

The General Dispensary. These units are organized for the purpose of providing medical and dental attendance for the commissioned, enlisted, and civilian personnel on duty at all large military headquarters within the theatre of operations.

They are also established to provide general professional attendance in all large communities having a floating military population.

The commanding officer of the dispensary, a medical officer, must possess great tact and administrative ability, and his assistants should be particularly well versed in the branches of their profession. The commanding officer must exercise very careful supervision over the general health and sanitary environment of the personnel attached to his headquarters.

During the stress of war, staffs at these headquarters, and particularly at general headquarters and the headquarters of the communications zone, at which will be found the master minds of the Army, work day and night and seldom avail themselves of opportunities for exercise, rest, or recreation. A grave responsibility in this respect, therefore, devolves upon the commanding officer of the general dispensary in reducing to a minimum the effects of wear and tear, during work at high tension, upon the officers and men of his command, to the end that mental and physical break-downs may not disrupt the staff machine at the very moment, perhaps, when it should work at its highest point of efficiency. Accordingly, in addition to providing all necessary professional attendance, routine physical surveys of the well should be made at stated intervals by the staff of this unit.

Careful sanitary inspections, at regular intervals, should also be instituted. The dispensary service should be subdivided into well-organized out-patient clinics. Facilities for physio-therapy are particularly advantageous.

The Laboratory Service. In campaign, the activities of military laboratories differ materially from those of civil institutions, and the conditions under which they operate are not comparable. These considerations make mandatory strict adherence only to procedures that are essential. The principal functions of a laboratory service in a theatre of operations may be broadly classified as (1) *epidemiologic,* (2) *clinical* (largely diagnostic), and (3) *special.* Under the first heading falls the control of communicable diseases, the laboratory service working in cooperation with *medical inspectors* to the accomplishment of that end. In this field of *preventive medicine* it is also charged with making and interpreting immune reactions and directing and supervising vaccination against smallpox, prophylactic inoculation against typhoid and paratyphoid fevers, diphtheria, dysentery, cholera, etc.

It also keeps a close watch over the wholesomeness of *food products* furnished the troops. It must pass upon the quality of all *water* used. The responsibility for the investigation of water resources, the development of water supplies, and the construction and operation of the plants necessary to make water available in sufficient quantity at designated points, rests with the *Engineer Corps,* but in the *Medical Department* is vested sole responsibility for supervision of its quality (potability).

Under the heading of clinical functions the laboratory service becomes a valuable agency in the medical and surgical services of the various hospitals employed in the theatre of operations.

The diagnostic functions in the theatre of operations are identical with those of thoroughly modern, scientifically conducted civil or military hospitals in home territory except as limited or amplified by certain phases in local conditions brought about through military necessity.

The special functions of the laboratory service are numerous and varied, and in most instances require special apparatus and equipment and highly trained specialist personnel. These special activities must be restricted largely to the General Medical Laboratory. Standardization of technique and material for the laboratory service in general is involved here. It includes also standardization, preparation, and distribution of all *antigens* and *amboceptors* employed throughout the theatre of operations. Other activities are the production and standardization of diagnostic sera, the preparation and distribution of standard chemical solutions, bacteriologic stains, colorimetric hydrogenion standards for the titration of culture media, special vaccines, toxins, and biologics; the identification and classification of a typical pathogenic organism; the confirmation of *cultures* sent in from other laboratories; special chemical examinations of foods to determine the nutritive value of ration components, and the preparation of special culture media for distribution to subsidiary laboratories.

Scientific investigations—*research*—is another special function of the laboratory service. It must be restricted, however, during periods of activity at the front, to problems of pressing necessity which offer in their solution a distinct contribution, directly or indirectly, toward the successful prosecution of military operations. Practically all of this work is done by the general medical laboratory.

The collection and preservation of pathological specimens to be sent to the Army Medical Museum at Washington for purposes of study and instruction, the initiation of special laboratory courses of instruction, and drafting briefs on technical subjects for publication to the Medical Department of the forces are additional special functions of the laboratory service.

Specially selected and trained personnel are assigned to the laboratory service. The entire service in a theatre of operations is supervised by a *director of laboratories* on the staff of the chief surgeon of the forces. This director prescribes the general policies to be followed. All hospitals without exception, whether mobile or fixed, are provided with their own internal laboratory facilities and personnel schooled in this line of work. There are, however, certain distinct and independent laboratory units recognized in our tables of organization which merit some description. As we would encounter them, from *front* to *rear,* they are:

The Medical Laboratory Section of the Medical Regiment. This unit provides a general laboratory service for each infantry division, and also for those army troops and corps troops of which medical regiments form a part. Because they work in the forward areas their equipment is reduced to an absolute minimum. Part of its personnel usually has a roving status, moving about through the divisional area initiating the necessary supervision over the quality of drinking water being supplied the troops. It also conducts investigations and examinations for the prevention and control of communicable diseases within the division area, under the general direction of the medical inspector.

This Laboratory Section should always be located so as to be accessible to all Medical Department formations in the division, maintaining for this purpose a messenger service. It may establish under tentage in the hospital station group or in such buildings, dug-outs, or other types of shelter, as may be available. It functions under the control of the commanding officer of the medical regiment, who, in an infantry division is also the division surgeon. For administrative purposes it forms part of the Service Company of the Medical Regiment.

The Army Medical Laboratory. This is a well-equipped, adequately staffed, self-sustaining, mobile laboratory. As an army unit it must serve as the *epidemiologic laboratory* for approximately all the troops in the army area which it serves. In its work it reenforces the medical laboratory sections of the various medical regiments attached to divisions and to the corps and army troops.

It is usually located in a permanent building near the headquarters of the field army, in close proximity to the office of the army surgeon. It is under the immediate control of the army surgeon.

The commanding officer of the army laboratory is the technical advisor of the army surgeon in all matters pertaining to the epidemiologic and other laboratory activities in the army area.

Its principal functions are to dispatch personnel and portable equipment to points within the army area where outbreaks of *communicable diseases* demand attention, to make field surveys and examinations of *water supplies,* to make special laboratory diagnostic tests (bacteriological, serological, and chemical), and lastly to prepare and distribute throughout the army zone such standard chemical solutions, stains and culture media as may be needed. Ordinarily its equipment is portable and packed in chests. In the event that it becomes immobilized, as would occur in an army of occupation, liberal provision is made for furnishing additional articles as may be required.

The General Medical Laboratory. As the principal stationary laboratory of an expeditionary force this unit should be adequately housed, staffed, and equipped.

It should not be permanently established until military operations have become stabilized sufficiently to warrant estimates as to the probable ultimate limits of the theatre of operations.

It should be centrally located on good lines of communication within the theatre of operations so as to serve with equal facility both the *combat* and *communications zones.* This laboratory is under the exclusive control of the chief surgeon of the field forces, thus giving it some measure of independence. (See subparagraph on The Medical Laboratory Service).

The C. Z. Medical Laboratory. These laboratories are also stationary in character and are established at vital points throughout the Communications Zone where they can best serve the needs of station hospitals, general hospitals not forming part of hospital centers, and aggregations of troops requiring an expert laboratory service.

They are usually housed in permanent buildings. They function under the immediate control of the Communications Zone surgeon. However, if the Communications Zone is officially divided up into sections and a section surgeon as a subordinate of the Communications Zone surgeon has been appointed, they may be designated to function under the immediate control of such section surgeon. In epidemiological and diagnostic work these laboratories constitute an important ally of *medical inspectors.*

The Medical Supply Service. The Medical Department is directly responsible for the supply of all medical materiel necessary for the health of the troops and for the care of all military sick and wounded in the theatre of operations and in the zone of the interior.

This is a very important responsibility and the actual procurement of all such supplies devolves upon central control directly coordinated by the War Department through the Office of The Surgeon General. This responsibility involves provision for the care of animals as well as men.

The forwarding of medical supplies to the theatre of operations is on a parity of importance with similar functions concerning ammunition, food, clothing, etc. The entire medical supply organization in a theatre of operations must be carefully systematized, if all the demands to be made upon it are to be expeditiously and fully met. The establishment of the necessary supply agencies is influenced by the depth of the theatre of operations and the availability of *traffic facilities*—rail, water, and motor.

The control of medical supplies in the theatre of operations is centralized in the office of the chief surgeon of the forces, but the agencies for carrying on the actual work are decentralized as far as location and activities are concerned. The various *echelons of medical supply* in a theatre of operations from the *base* towards the *front* are: (1) C. Z.

Medical Supply Depots at the base; (2) C. Z. Medical Supply Depots in the intermediate section; (3) Army Medical Supply Depots; (4) Medical Supply Sections of Medical Regiments. Within these echelons of supply there must be available the following classes of strictly technical materiel for the Medical Department: Combat, hospital, laboratory, X-ray, dental, veterinary, and Red Cross accessory.

All troops arriving in a theatre of operations have with them, or shipped as part of the same convoy, what is termed their *initial unit equipment.* The expendable articles in this initial equipment usually represent about a 120-day normal supply. In other words, each unit arriving in the theatre of operations should be able to carry on for at least that length of time before making further calls on depots for replenishment of medical supplies.

This factor of *replenishment* of necessary supplies constitutes one of the biggest problems with which the Medical Department finds itself confronted in war. Without a steady flow of supplies to them, hospitals and other units would soon find themselves in difficulty and unable to properly function. Accordingly, in addition to seeing to it that each unit dispatched to a theatre of operations has its initial or unit equipment, the zone of the interior, through its War Department agencies, must also forward at stated intervals the *commodity replacements* necessary to maintain it.

Of the total *tonnage* allotted to a field force, that of the Medical Department will represent a minimum of 1½ per cent and a maximum of 1 8/10 per cent. In the earlier phases of the operations a relatively large proportion of this allotment will be consumed in bringing in initial equipment and but a small proportion will be taken up by replacement supplies. This ratio will reverse itself in the latter phase of the operations, when the major portion of tonnage will be devoted to replacement and reserve purposes.

Roughly, for each man within an expeditionary force approximately 25 pounds of material per day must be shipped for replacement purposes alone. Of this 25 pounds, covering all items such as ammunition, food, clothing, as well as medical supplies, the Medical Department takes up about 1½ per cent. or approximately 4/10 of a pound.

To receive and equitably distribute the medical supplies flowing in to a theatre of operations the depots already mentioned are established. In these depots every effort is made to accumulate a reserve supply. At least a reserve sufficient to last 30 days, in the event the forces were cut off from supply sources in the zone of the interior, should be maintained.

These *reserve supplies* are distributed in depots in decreasing amounts from the base forward. As far as practicable this contemplates a distribution throughout the theatre of operations of reserve medical supplies sufficient for 15 days in the base, 10 days in the intermediate, and five days in the advance *echelons.*

All of these depots are kept stocked with reserve supplies largely through the operation of what is known as an *Automatic Supply Table.*

This table is carefully prepared as a war-plan feature in time of peace and exhibits thousands of itemized articles of medical supplies of every character essential to the efficient administration of the Medical Department in the particular theatre of operations. Its preparation is based upon troop, time, and consumption factors.

Fig. 24.—A Supply Depot (C.Z.) Established by the A. E. F. in France during the World War. A medical section constituted part of this depot.

Usually one *automatic increment* represents the amount of medical supplies that must be shipped every 30 days for every 20,000 men in a theatre of operations. In other words, as troops go forward, so must a definite ratio of balanced medical supplies be sent into the theatre. For example, if it has been decided that for each 20,000 men, 700 one-fourth pound cans of ether will be normally consumed in 30 days, that amount becomes necessary as replenishment each 30 days for each 20,000 men in the theatre of operations, and is made the automatic factor for ether. Therefore if there are 2,000,000 men within a theatre of operations there must be forwarded to it every 30 days 70,000 cans of ether. Remember that this illustrates only one item among the thousands that appear on the automatic supply table list of the Medical Department. The supply authorities in the zone of the interior (War Department) adhere rigidly to this automatic supply table until they receive amendatory instructions from the supply representative in the office of the chief surgeon of the field forces.

The plan evolved for the distribution of medical materiel contemplates the establishment of two classes of depots, i, e., those devoted to detailed issues and those which handle original packages in car-load lots.

In all units a system of property exchange is maintained. This starts with the Collecting Company at the front and is continued by all other units through which the patient passes.

Every litter, blanket, and splint taken over at an aid station is immediately replaced by one from the Collecting Station equipment. When an ambulance takes over the patient at the Collecting Station it replaces there. Upon delivery at the hospital station the ambulance is supplied by the latter, and so on down through every unit. This system assures a balanced supply of these vitally essential articles.

The C. Z. Medical Supply Depot at the Base. This depot falls within the last mentioned category. It is established at the point where supplies from the zone of the interior enter the theatre of operations, either by rail or water. It receives these supplies in bulk, and sorts and distributes them to the depots in its front. Seldom does it ship less than car-load lots and frequently an entire train of medical supplies is dispatched by it to an intermediate medical supply depot, which is its most important customer.

The C. Z. Medical Supply Depot in the Intermediate Section. The intermediate depots constitute the second echelon of medical supply, receiving their initial and replenishment stocks from medical supply depots at the base. In general these stocks constitute all of the items that are needed by the *Army Supply Depots,* and in addition all the items necessary for the hospitalization in the intermediate zone. Many of the general hospitals—hospital centers—and station hospitals are equipped and supplied by these intermediate depots.

The Army Medical Supply Depot. These depots, one per army, constitute the third echelon of medical supply from rear to front. Their function is to meet the medical supply needs of the army to which they pertain. This includes both the forces in actual combat or in reserve, and the special hospitalization, such as surgical hospitals and evacuation hospitals, within an army.

The stocks carried by these depots are received for the most part on a ten-day automatic basis principally from intermediate depots or when possible by direct shipment from base depots.

To expedite deliveries at the front and avoid the necessity for frequent long trips, a section of the army depot may be established in corps areas and then become known as a corps "park". Supplies for such "parks" are forwarded by motor truck or light military railways, from the parent army depots. These parks or distribution points are always temporary installations, frequently being moved forward as the troops advance.

The Medical Supply Section of the Medical Regiment. This comparatively small unit, the fourth and last echelon of supply from rear to front, is provided for the purpose of procuring replenishments of the medical and hospital supplies needed by the medical detachments of the division as well as the components of the medical regiment. When the division is in action it establishes a medical supply distributing point at a designated spot in order that all Medical Department units requiring replacements of medical supplies may know where to find it and have their requisitions filled. At the beginning of an engagement it may stock up with not more than three days' supply of essential dressings, splints, etc., in anticipation of the calls that may be made upon it. At no time should it keep on hand as a reserve measure more supplies than can be carried in the trucks authorized for it. Frequently the medical supply station or distributing point is established by this unit alongside the hospital station group.

The Hospital Ship. In war it must be remembered that our sister service, the *Navy,* plays a very prominent role. In all our war planning in which the Army and the Navy are apt to be jointly involved, the Medical Departments of the two services work hand in hand in reaching a workable and satisfactory solution. Representatives from the Office of the Surgeon General of the Army and the Office of the Surgeon General of the Navy frequently confer on all matters likely to require joint action in campaign. The principles discussed under this heading include the activities at ports of embarkation, while at sea, during landing operations, and at ports of debarkation.

As soon as base ports have become organized and our military hospitalization in the theater of operations established a steady flow of evacuations from the expeditionary forces must be inaugurated in order that all those who have ceased to be military assets may be gotten out of the theater. This necessitates the establishment of a well systematized method of handling large numbers of sick and wounded to be embarked on vessels, preferably *hospital ships,* for transportation to home territory. To meet this eventuality, the Army and the Navy have jointly drawn up a tentative set of principles, under which the Navy would assume full responsibility for the transportation, care, and treatment of patients between the base ports and the home ports. This involves the use of hospital ships and following are given ten views of the Army thereon:

1. In any war of the future the Medical Department of the Army believes that for the overseas evacuation of patients from a theater of operations reliance should be placed solely upon quickly convertible and available commercial tonnage.

2. For purposes of classification, vessels so taken over and converted into use as hospital ships should be designated as Class B.

3. Class B hospital ships should be the only type utilized for Army evacuations.

4. Our conception of a Class A hospital ship is the specially constructed vessel on duty with the Navy and serving as the floating hospital of the fleet.

5. In our opinion the converted or Class B hospital ship should be a

Medical Department organization exclusively and recognized as entitled to all the protection accorded by both the Geneva and Hague Conventions.

6. Troop transports utilized for the transportation of patients will not be entitled to protection, and all the persons thereon held subject to the usual belligerent risk.

7. As to the lines of control to be exercised over the overseas transportation of sick and wounded the Medical Department of the Army believes: (a) That if the transport service is in charge of the Navy (e.g., under conditions such as existed in the World War) Class B hospital ships should also be in charge of the Navy, and the responsibility for the proper care, treatment and protection of patients being transported thereon devolves upon the Navy between the ports of embarkation and debarkation. (b) That if the transport service remains in charge of the Q.M.C. of the Army, Class B hospital ships should be provided by and operated under the control of the Army.

8. That hospital ships of either class should be commanded by a medical officer.

9. That Class B hospital ships or other ships which in emergencies are transporting exclusively sick and wounded should enjoy the same immunity of war as is accorded Class A hospital ships by the International Conventions.

10. That suitable amendments to International Conventions should be sought, to the end that some ready means of identifying vessels transporting sick and wounded can be devised over that now prescribed for typical Class A hospital ships. In short, how shall a vessel utilized today for the transport of combatant troops be marked tomorrow when on a turn-around it is transporting back to the base exclusively sick and wounded? It should be so marked as to preclude enemy aircraft and submarines from sinking it in the belief that it was still a combatant ship. In this connection it must be remembered that our experience in the World War in transporting sick and wounded from France to the United States was unique, in that our sea lane was kept practically clear of the enemy. Imagine the storm of public opinion which would have been aroused had one of these large ships carrying patients been sunk in the mid-Atlantic. No civilized nation desires to wage war against the disabled, to sink ruthlessly a ship carrying men whose combat value is nil. After all, public opinion, national as well as international, is a weighty item in the conduct of any war. It is only fair and just that a way be devised to give all belligerents some ready means of quickly identifying a ship that is transporting noncombatants—*the sick and wounded.* No effective method of solving this problem has as yet been laid down in our International Conventions. The Class A hospital ship which remains the floating hospital throughout hostilities is properly marked and immune. Our attention must now be directed towards obtaining the same immunity for Class B and other ships utilized in the transportation of patients. The problem is an easy one to solve but it requires international consideration

and action at The Hague. The Medical Department of the Army is firm in the belief that this question of neutralizing ships for patients must be taken up and settled before the advent of another war. Furthermore, it is believed that all available space on these immunized ships in proceeding to the theater of operations should be utilized in transporting the personnel and matériel of hospital units for the Medical Departments of the military and naval forces, in order that such forces may enjoy the assurance, guaranteed by such immunity, that these vitally essential units shall reach their destination for service as intended, and not be submitted to the risk of being sunk as would be the case if transported on a combatant ship. Reference is here made to vessels that have been set aside for use as Class B hospital ships and given proper distinguishing marks before departure from the homeland. This is not proposed for the benefit of the Medical Department personnel themselves. It is a measure specifically designed to give additional assurance that the combatant forces will have at hand the necessary Medical Department installations properly to care for the sick and wounded that accrue. Medical Department allowances are never prodigal, and one can well picture the situation confronting any force that has lost by avoidable sinking any appreciable number of hospital units.

The Army Hospital Ship. Experience has demonstrated that the most efficient and economical hospital ship for long voyages is one having a capacity of not less than 500 beds. Whenever the Army is required to outfit and put in service a hospital ship of that capacity it would provide for it, in addition to the crew and navigating personnel aboard, Medical Department personnel consisting approximately of 25 officers, 60 nurses, and 200 enlisted men; commanded by a colonel of the Medical Corps.

Statistical Factors. In preparing for combat activities and in solving as they arise the many problems confronting a medical service in the field, there are certain statistics and factors which must always be borne in mind. In fact it is upon these data as gleaned from experience tables that the setup above described is based.

In the epitomized statistics given below an attempt has been made to adhere as far as possible to such round numbers as will approximate average conditions of *open warfare* (movement) and *stabilized warfare* (trench).

While the statistics of other wars have been carefully considered, those of the World War stand out and it is upon them that we should mainly rely in making our computation in future emergencies. The statistics available are so voluminous and variable that only a few of the more important and reliable may be given.

The Sick. In a seasoned command count on an average daily increment of 0.6 percent of sick and an average daily non-effective rate of 6 per cent. (This includes all men not performing regular duty) The average number of days lost in hospital on each case of disease is 24. Therefore in a division of 20,000 men 120 new cases will be admitted to the sick report daily. Of these about 1/3 or 40 will immediately or eventually be evacuated outside the divisional area, half of them sitting and half of them prone. The remainder will remain under treatment with their own organization (aid station or dispensary) or in one of the hospital stations of the division, and within a few days be returned to duty.

Of all sick cases arising 1 percent may die, 4½ percent will be invalided home or otherwise disposed of, and 94½ percent returned to duty. All *injuries* not classified as battle casualties are included under this heading of sick. The ratio of injuries (not battle casualties) to sickness varies between 1 to 12 to 1 to 4; 1 to 8 may be taken as a working average.

Of the *non-hospitalized* cases, those kept within a division area, constituting 2/3 of all admissions to sick report, the average number of days lost from sickness is 4, and the day on which the maximum number of these cases on hand is reached is the 6th.

Of the *hospitalized* cases, those evacuated outside a division area, constituting 1/3 of all admissions to sick report, the average number of days lost by *slight* cases is 10, and the day on which the maximum number on hand is reached is the 15th. In *severe* cases the average number of days lost is 32, and the day on which the maximum number on hand is reached is the 51st.

The Battle Casualties. The maximum daily loss in battle at the hands of the enemy in a major engagement which a division or corps can sustain without having its combat efficiency materially impaired, will average about 8 per cent for the division as a whole, and in a front line regiment about 12 percent. Therefore for purposes of computation the maximum casualty day for a division may be set down at *10 percent of its total strength.*

In open operations, the normal field of an army, the ratio of killed to wounded will be 1 to 6; in trench warfare it may fall as low as 1 to 4.

Taking average conditions, of all casualties sustained, 15 percent will be *killed* outright; 45 percent, constituting the *slightly wounded,* will be able to walk back to hospital stations in the divisional area; and the remaining 40 percent, constituting the *moderately* and *severely wounded,* will require transportation, half of them sitting and the other half lying. Of the 20 percent of battle casualties classified as requiring transportation in the lying position, 8 percent, constituting the most severely wounded, are *nonevacuable* and must not be transported beyond the surgical hospital, but the remaining 12 percent, after proper preparation, can be transported with safety to an evacuation hospital.

Of all those wounded (85 per cent of all battle casualties) 1/3 will recover within 30 days; average 14 days. The remainder of the recoverable cases will require treatment for slightly over three months before they are again fit for duty. Six (6) per cent will die from their wounds; 71 percent will be returned to duty from within the theatre of operations; 23 percent will be evacuated to the zone of the interior. Of this 23 percent one-half of the cases, after prolonged treatment, will be returned to duty and the remaining half will be discharged as unfit for further military service.

Therefore it will be noted that of all men wounded, when those killed outright are excluded in the computation, approximately 83 percent are eventually restored to a duty status. On the other hand, when considering *all* battle casualties, including those killed outright, those who subsequently die in hospital, and those who are finally discharged as disabled, we may write off as permanent losses to our man-power, as far as military assets are concerned, approximately 1/3 of all men hit in action.

Of the wounds received in action 14 percent will involve the head and neck, 14 percent the trunk, 32 percent the upper extremities, and 40 percent the lower extremities.

The kind of wounds incurred is governed by the character of warfare and the variety and amount of armanent being employed by the contending forces. Under certain conditions large wounds from shell or shrapnel may predominate, sometimes amounting to 70 percent of the total; on the other hand the majority of wounds may be caused by small-arms missiles. Comparatively few wounds are inflicted by saber or bayonet.

For reasons which should be obvious in the light of recent international conferences a consideration of the incapacitating effects incident to the use of Chemical Warfare agencies, particularly *lethal gases,* has purposely been omitted in this discussion. Suffice it to say, however, that when gas is used by an enemy over ½ of all the casualties handled may have been produced by that agency alone.

The Operations Plan. The Medical Department phase of an Operations Plan (the campaign program) can be separated finally into two portions. One is of interest to all branches of the service and is issued as part of the general plan; the other interests only the Medical Department and is made the basis for its internal activities during the execution of the general plan. Operations plans, depending upon the size and importance of the command, vary from the very simplest considerations in the case of the battalion surgeon to the complex program of the War Department.

The Estimate of the Situation.—In the preparation of the Medical Department phase of the operations plan or any part thereof the initial step is to make an estimate of the situation. This requires a consideration of:

1. The mission (objective) assigned to our forces, i.e., the military "prescription."

2. Information about the enemy: a. The strength and position of his forces; b. His operations plan, particularly as concerns evacuation, hospitalization and medical supply; c. Prevalence of disease in enemy territory.

3. Information about our own forces; a. Strength, location, etc.; b. Our position as affecting casualties, the movement of Medical Department units, and routes of evacuation and supply; c. Our supporting troops; d. The economic and industrial situation in home territory as affecting the supply of Medical Department materiel.

4. Terrain in the theatre of operations: a. Surface contours influencing protection and routes of evacuation; b. Geological formation as influencing water supplies and underground shelters; c. Weather conditions as affecting operations, and, for example, the use of gas by the enemy.

5. The estimates required as a basis for the development of the Medical Department plan: a. Probable duration of combat activities; b. Probable casualties; c. Transportation requirements—

(1) For the evacuation of casualties by: (a) Litters, (b) Litter carriers, (c) Ambulances, (d) Rail Transportation (hospital trains), (e) Water transportation. This comprises the utilization of commercial transportation, such as canal boats, lake and river steamers, and ocean-going liners in addition to regular hospital ships depending upon the needs of the situation. Ordinarily where ocean transportation forms an essential link in the evacuation chain, one hospital ship is required for each army in the theatre of operations, in addition to the troop transport accommodations available.

(2) For Medical Department personnel. This estimate must be made when the transportation provided in the equipment table of an organization is inadequate for the contemplated move. In a movement by road, for example, a heavy touring car for officers or nurses carries six persons, and a 3-ton truck for enlisted men carries 20 persons with baggage, and 40 persons without baggage. In a movement by rail, for example, a day coach (three persons per double seat, short trips) carries 48 persons, and a tourist sleeper (3 persons per section, long trips) carries 48 persons.

(3) For Medical Department materiel. Divisional Medical Department units are provided with transportation adequate to move their personnel and materiel. For other field units it becomes necessary to draw on transportation "*pools*" for means of transport. The capacity in weight tons (2000 pounds) of the various motor trucks utilized varies from 1½ to 5 tons. Capacity of the average box car (U. S.) is 40 tons. For example, to move the *equipment* of an evacuation hospital by rail five box cars and four flat cars are required.

d. Hospitalization. Hospital beds are of two classes—evacuation beds and treatment beds. The former pertain to mobile formations in the combat zone and the latter to the fixed establishments (general hospitals and station hospitals) in the communications zone. Treatment beds to be provided in the theatre of operations should be definitely prescribed. In general it may be said that any extensive hospitalization program will require 50 per cent new construction. During the initial effort of an operation program there will be but relatively little, if any, new construction, whereas towards the end of an extended war new construction will approximate 100 per cent.

e. Supply. Estimates of the supplies required for an operation plan will include all items of supply in the basic tables of equipment. The estimate should show the initial equipment and the maintenance needs, expressed so as to exhibit for each article, the kind required, weight in pounds (or short tons), cubic tons, and storage space required. The basis taken for the tonnage estimate is the short ton of 2000 pounds and the ship ton of 40 cubic feet. Each short ton equals 3.3 cubic tons. One cubic or ship ton equals 40 cubic feet. The average ratio of Medical Department equipment and supplies, weight to volume, is 1 to 3; i. e. 2000 pounds of mixed medical supplies take up 120 cubic feet of space. *Storage space* is usually expressed in terms of square feet of floor space required for supplies when storage is in 8 feet stacks, including aisles. Storage space required for Medical Department supplies amounts to 0.5 sq. ft. (8 ft. stack) per man in the forces.

f. Personnel. In the entire forces during a major campaign the Medical Department quota should be approximately as follows for each 100,000 of the total strength—700 Medical officers, 150 Dental officers, 50 Veterinary officers, 120 Medical Administrative Corps, Sanitary Corps, and Warrant officers, 1,500 graduate nurses, 150 nurse aides, 9,580 enlisted men for Medical and Dental Services and 1,200 enlisted men for Veterinary Service. In the theatre of operations alone the total Medical Department personnel may equal 10 per cent of the total force in the theatre.

g. Financial. The Medical Department cost is approximately 2 per cent of the total cost of the military establishment. It can be figured for the Medical Department on a basis of $70 per man-year, not including pay of the Army or new construction. To illustrate, with 2,000,000 men mobilized there will be needed for the purchase of Medical Department supplies one hundred and forty million dollars annually.

The Development of the Plan.—Based upon all the factors assembled in drawing up a comprehensive estimate of the situation the entire Medical Department Plan is developed with subdivisions prepared under headings such as:

1. An administration plan; 2. A training plan; 3. An equipment plan; 4. A hospitalization plan; 5. An evacuation plan; 6. A sanitation and preventive medicine plan; 7. A personnel plan; 8. A dental plan; 9. A veterinary plan; 10. A supply plan; 11. Statistics.

Organization for National Defense.—The successful prosecution of an Operations Plan is predicated upon the existence of a well-balanced and systematized military establishment, the various components of which, whether they be on an actual or potential status, must work in harmony and be ready to take to the field in the event of a national emergency declared by Congress. In accordance with legislation of comparatively recent enactment our military forces are now grouped into one coordinate body known as the Army of the United States, consisting of three components, viz.—The Regular Army, the National Guard, and the Organized Reserves. The mission of these three components of the Army of the United States should be clearly understood by all those interested in national preparedness and the organization of the Medical Department for field service. (See Chapter II.)

CHAPTER VI

RULES OF WARFARE

Introduction. The conduct of war is regulated by certain well-established and recognized rules that are usually designated as the "*Laws of War,*" which comprise the rules, both written and unwritten, for the carrying on of war both on land and at sea. They are of more than passing interest to the individual soldier.

Written Rules. These are adopted by means of conventions and treaties entered into by the principal civilized nations, usually referred to as the Brussels Convention, the Geneva Convention, the Hague Convention, etc.

Unwritten Rules. These are well recognized usages and customs that have developed into and have become recognized as rules of warfare. The development of laws and usages of war is determined by three principles: *First,* that the belligerent is justified in applying any amount and any kind of force which is necessary for the purpose of the war; i.e., the complete submission of the enemy at the earliest possible moment with the least expenditure of men and money. *Second,* the principle of humanity which dictates that all such kinds and degrees of violence as are not necessary for the purpose of war are not permitted to a belligerent. *Third,* the principle of chivalry, which demands a certain amount of fairness in offense and defense and a certain mutual respect between opposing forces.

Object of War. The object of war is to bring about the complete submission of the enemy as soon as possible by means of regulated violence. Military necessity justifies a resort to all the measures which are indispensable for securing this object and which are not forbidden by the modern laws and customs of war. It does not admit of cruelty nor of torture to extort confessions.

Martial Law. Martial law is simply military authority exercised in accordance with the laws and usages of war. It extends to property and to all persons in occupied territory.

Declaration of War. Before commencing hostilities a nation must declare its intention to resort to war. Neutral nations must be notified of the existence of a state of war between the contending forces.

Classification of Enemy Population. These are recognized as falling into two classes, the *armed forces* and the *peaceful population.* The armed forces must be commanded by a person responsible for his subordinates, wear a uniform, carry arms openly, and conduct their operations in accordance with the laws and usages of war.

Prisoners of War. A prisoner of war is a person whom the enemy, upon capture, temporarily deprives of his personal liberty. A member of the *medical service* falling into the hands of the enemy is not a prisoner of war (see Geneva Convention). The sick and wounded *do* become prisoners of war. All the personal belongings of prisoners of war remain their property. Upon capture a prisoner of war is required only to give his true name and rank. He is not bound to reply to other questions put to him by enemy agents in an effort to obtain information for military purposes, nor can he be punished for refusing to answer such questions. If they attempt to escape, prisoners of war may be fired upon and shot down. Prisoners of war may be set at liberty on parole under certain conditions, but no non-commissioned officer or private can give his parole except through a commissioned officer.

Conduct of Hostilities. There are some things a belligerent must not do. He must not purposely spread *contagious disease* nor poison sources of water supply. He must not use missiles which inflict unnecessarily cruel wounds, such as explosive or *soft-nosed bullets* which upon hitting the body mushroom and cause prolonged suffering. He must not kill or wound an enemy who has laid down his arms, or who having no longer means of defense, has surrendered. He must not force a person to fight against his own country.

Espionage and Treason. A person can only be considered as a *spy* when, acting secretly or on false pretenses, he obtains or endeavors to obtain information in the Zone of Operations of a belligerent with the intention of communicating it to the hostile party.

All unauthorized or secret communication with the enemy is considered *treasonable* by the law of war.

A *war traitor* is a person in a place or district under martial law who, unauthorized by the military commander, gives information of any kind to the enemy or holds intercourse with him. (All the aforementioned acts are punishable with death, after fair trial and conviction).

Signification of White Flag. The white flag, when used by troops, indicates a desire to communicate with the enemy. The hoisting has no other signification in international law. It may indicate that the party hoisting it desires to open communication with a view to an armistice or a surrender. If hoisted in action by individual soldiers, or a small party, it has come to signify *surrender.* The enemy is not required to cease firing when a white flag is raised. To indicate that the hoisting is authorized by the commander the belligerent must cease firing.

Armistice. An armistice is the *cessation of active hostilities* for the period agreed on between belligerents. The exact moment for the commencement and that for the termination of an armistice are usually stated in the terms thereof beyond any possibility of mistake or misconception.

An armistice may be *general* or *local*. The first suspends the military operations everywhere, the second only between certain parts of the belligerent armies within a fixed radius.

Geneva Convention. This conference was called by the Swiss Federal Council with a view to revising the International Convention of 1864, for the amelioration of the condition of soldiers *wounded* in the armies in the field. The final text of the Convention bears the date of July 6, 1906. It is important that all members of the Medical Department thoroughly understand what the rights and privileges of themselves and of the sick and wounded under their care are according to the terms of this International Convention, of which the United States is a signatory. Following are its principal provisions.

The sick and wounded must be taken care of irrespective of nationality.

Members of the medical service, if they fall into the hands of the enemy, are not to be regarded as prisoners of war. They must be sent back to their own side, but only when the enemy can arrange to do this conveniently to himself and by the route which he shall determine as best suitable. Until they can be sent back to their own country or forces, medical personnel must continue their duties under the direction of the enemy, caring for the sick and wounded of their own nationality, and while so employed are entitled to pay and allowances.

Sick and wounded who fall into the enemy's hands are, however, prisoners of war and under the convention are not entitled to any privileges different from those of unwounded and healthy prisoners, beyond that of proper medical attendance.

When compelled to abandon his sick or wounded to the hands of his enemy, a belligerent must leave with them a portion of medical personnel and equipment to assist in caring for them.

After every engagement each belligerent must search the field of battle, collect the disabled, and protect the wounded and dead from robbery and ill treatment.

All mobile formations and fixed establishments of the medical service must be protected and respected by the belligerents. They must not be deliberately fired upon so long as they do not commit acts injurious to the enemy. On the other hand they may be fired on if they are sheltering spies or combatants, conceal munitions, or place themselves in front of their own forces firing on the enemy.

Personnel of the medical service *may be armed* and *use such arms* in self defense or in the defense of the sick and wounded in their care. These arms are for their personal defense and for the protection of the sick and wounded under their charge against marauders and the like. The members of the medical service must not resist with such arms their being captured by the enemy.

A unit of the medical service is entitled to the protection of the Geneva Convention, even if the formation is guarded by an *armed detachment* or by sentinels from other branches of the Army, acting under competent orders, or when arms or cartridges taken from the wounded, not yet turned over to the proper authorities, are found in the formation or establishment.

When they fall into the power of the enemy, medical units retain their materiel, transportation, and conducting personnel, all of which must be returned in accordance with the conditions relating to medical personnel, and as far as possible, at the same time.

Fig. 25.—Ground Marker for a Hospital.

Out of respect to Switzerland, the heraldic emblem of the *Red Cross* on a white ground was adopted as the emblem and distinctive sign of the sanitary service of armies. (Some non-christian countries, in acceding to the Convention, reserved the right to use another emblem in lieu of the Red Cross, e.g., Turkey employs a *red crescent,* and Persia a *red lion combined with a red sun.*

The Red Cross appears on flags and brassards as well as upon all materiel pertaining to the medical service. To protect them under the terms of the Convention medical personnel wear on the left arm a Red Cross brassard, issued and stamped by the Medical Department. Medical formations and establishments fly a Red Cross flag, accompanied by the national flag. Should these units fall into the power of the enemy, they fly no flag other than that of the Red Cross.

The *Red Cross* may be utilized either in peace or war only to protect or designate the medical formations and establishments, and the personnel and materiel, protected by the Convention. (The Convention adopted no means of identifying medical formations at night. There seems to be no fixed rule among nations in regard to this designation at night. By the United States *green lights* (lanterns) are used for this purpose. French medical formations use two lights—red and white—the one above the other. Great Britain uses two white lights and some other countries one or more red lights.)

A future Convention will have to discuss the aspects of aviation with reference to protection of the sick and wounded.

Airplanes are now being used as ambulances and an official method of marking them for identification on both day and night flights must be prescribed.

The question of ground markers for fixed establishments entitled to protection will also merit consideration. During the World War ground markers in the form of the Geneva Cross were extensively used. If properly displayed they quickly identify the character of the unit to the man in the air. Fig. 25 shows a ground marker of white sheeting. Each arm of the cross was 24 feet long and 8 feet wide. The photograph reproduced herein was taken from an elevation of 5,000 feet but the cross could still be seen distinctly on those taken at an elevation of 15,000 feet.

Hague Convention. This Convention was called in 1907 for the purpose of adapting the principles of the Geneva Convention of 1906 to maritime warfare. Its principal provisions have practically the same application to ships and the sea forces, as the parallel situations mentioned above in the Geneva Convention, have to the land forces.

Following are some of its interesting provisions. *Hospital ships* shall be respected and cannot be captured while hostilities last. Before being employed as hospital ships their names must be communicated to the enemy. Their stay in a neutral port is not governed by the same rules as apply to men-of-war. They must not be used for military purposes other than to relieve and assist the sick, wounded, and ship-wrecked. They must not hamper the movement of combatant ships and during and after an engagement they act at their own risk and peril. By the enemy they can be controlled, searched, denied help, ordered off, and made to take a certain course.

Hospital ships are distinguished by being painted *white* outside with a horizontal band of *green* about a meter and a half in breadth.

Hospital ships equipped wholly or in part at the cost of private individuals or officially recognized relief societies either of their own country or of neutral countries, are distinguished by being *white* outside with a horizontal band of *red* about a meter and a half in breadth. The small boats of hospital ships and also other small craft which may be used for hospital work are distinguished by similar painting.

All hospital ships must make themselves known by hoisting, with their *national* flag, the *white* flag with the *Red Cross,* provided by the Geneva Convention. Hospital ships belonging to a neutral country must fly at the mainmast the national flag of the belligerent under whose control they are placed. Hospital ships detained by the enemy must haul down the national flag.

At night, in order to secure protection, hospital ships must take the necessary measures to render their special painting sufficiently plain. The presence of wireless telegraphy apparatus on board a hospital ship does not deprive it of protection.

In the case of a fight on board a *warship,* the sick wards are respected and spared as far as possible.

Any warship belonging to a belligerent may demand that the sick, wounded, or ship-wrecked wounded on board hospital ships be handed over as prisoners of war. The medical personnel are entitled to the same protection as outlined above in the Geneva Convention. If prisoners of war are sent by the enemy to a port in their own country they cannot serve again while the war lasts.

Voluntary Aid Societies. Article X of the Geneva Convention specifically provides that the personnel of voluntary aid societies, duly recognized and authorized by their own governments, may be employed in the medical units and establishments of armies and are placed on the same footing as medical personnel, provided always that they shall be subject to military law and regulations.

Each nation is required to notify the other, either in time of peace or at the commencement of hostilities, the names of the societies which it has authorized under its responsibility to render assistance to the regular medical service of its armies.

American National Red Cross. This association, incorporated by the Congress of the United States, under the Act of January 5, 1905, is the only *volunteer aid society* that can be employed by the land and naval forces of the United States to assist their medical services. It furnishes aid to the sick and wounded in accordance with the spirit and conditions of the Geneva Convention.

In time of war the President calls upon the American National Red Cross for such assistance from that body as he may deem necessary. Individuals or units thereof are assigned to duties and localities designated by component military authority. The personnel of the American National Red Cross, while so employed with the Medcial Department, are entitled to the same privileges and protection as are accorded to the latter. They wear a distinctive uniform.

As the Medical Department of the Army is charged with the administration of the medical service, all *medical* aid rendered by the American

National Red Cross is required to be performed under the direction of the former. While so serving it is considered a part of the medical service of such forces. It is not intended that the Red Cross shall duplicate or parallel the work of the War Department.

In addition to its primary function of assisting the sick and wounded the Red Cross also carries on a system of national and international relief in time of peace or war, the value of which is universally recognized.

In peace and war, it conducts a program of home service for the able-bodied of the military service, and hospital and social service for patients. When the War Department desires the services of the Red Cross it specifies the character of service required, the Red Cross units desired, the materiel and personnel desired, and the place or places where the agencies or materiel will be assembled. In the majority of instances, such calls upon the Red Cross are for reserve nurses for the Army Nurse Corps, dietitians, and units such as emergency nurse detachments, convalescent homes, and depots for Red Cross supplies.

CHAPTER VII

MILITARY COURTESIES AND CUSTOMS

Introduction. In an Army rigid discipline is necessary. Discipline is the instant and willing obedience to orders. Military courtesy is one of the outward signs of discipline.

In a very positive fashion in our official regulations, we prescribe how military courtesy is exercised. Don'ts are seldom, if ever, mentioned. On the other hand, well established customs too numerous to mention have been adopted by the Army in what might be termed its unwritten code of ethics. By keeping on the alert and carefully observing the conduct of *"old-timers"*, officers and men new to the service quickly acquire a knowledge of these customs and faithfully abide by them. By way of illustration we need cite out a few examples.

Addressing an Officer. It is not considered proper for an enlisted man to say "you" to an officer. In official conversation officers or soldiers are referred to by their titles. In speaking to an officer it is customary always to use the *"third person"*. **Examples:** "Sir, I am unable to find Sergeant Smith. Sergeant Jones said to tell *The Major* that he saw him leaving the hospital." "Sir, Private White has the permission of the First Sergeant to speak to the company commander." "Sir, at what time does *The Colonel. . . .*"

Seeking an Interview. A soldier should never seek an interview with his commanding officer without first obtaining permission to do so from his first sergeant. The reason for this is that the first sergeant is the commanding officer's helper and in most cases can give the information desired or necessary instructions, thus saving the commanding officer's time for more important matters. When necessary, however, remember that the soldier seeking counsel or advice, whether on official or private matters, can always obtain an interview with his commanding officer, the first sergeant invariably granting him the necessary permission.

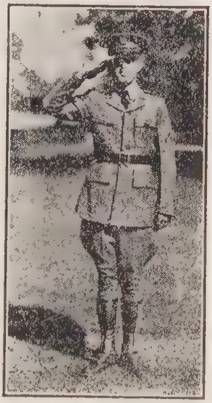


Fig. 26. The hand salute.

Saluting. Again, on the matter of rendering salutes. When saluting don't bow. Hold up the head. Look straight at the person saluted. (Fig. 26.) Don't drop the hand until the salute has been returned. Don't bring down the hand in two motions. Bring it down from the visor to its natural position at the side in one quick sharp motion, without slapping the leg.

Don't report and salute at the same time. Complete the salute and then make the report.

Honors and Salutes.—Honors are rendered by salutes with cannon; playing of "The Star Spangled Banner," playing "To The Colors" or "To The Standard" by field music; parades, reviews, escorts; ruffles by drums; flourishes by bugles; dipping of regimental colors or standards; turning out the guard; saluting by troops; half-masting the flag; and by visits.

The honors to be paid a certain person or group depend on the official status of the one or ones to be saluted and are laid down in Army Regulations.

The commanding officer is saluted by all commissioned officers in command of troops or detachments. Troops under arms salute as prescribed in training regulations.

When making or receiving official reports or on meeting out of doors all officers salute. Military courtesy requires the junior to salute first, but when the salute is introductory to a report made at a military ceremony or formation to the representative of a common superior—as, for example, to the adjutant, the officer of the day, etc., the officer making the report, whatever his rank, salutes first; the officer to whom the report is made acknowledges, by saluting, that he has received and understood the report.

Exchange of Salutes. Salutes are exchanged between officers and enlisted men upon every occasion of their meeting, passing near, or being addressed, except on the following occasions: when in military formation, when at drill, work or games, or at mess; when in public conveyances; or when at public meetings for the purpose of social diversion or amusement.

When an officer enters a room where there are several enlisted men, the word "*attention*" is given by someone who perceives him, when all arise, uncover, and remain standing until the officer leaves the room or directs otherwise. Enlisted men at meals stop eating and remain seated at *attention.*

An enlisted man, if seated, rises on the approach of an officer, faces toward him, stands at attention, and salutes. Standing, he faces the officer for the same purpose. If such parties remain in the same place or on the same ground, such compliments need not be repeated. Soldiers actually at work do not cease work to salute an officer unless addressed by him.

Before addressing an officer, an enlisted man makes the prescribed salute with the weapon with which he is armed, or, if unarmed, with the right hand. He also makes the same salute after receiving the reply.

In uniform covered or uncovered, but not in formation, officers and enlisted men salute military persons as follows: With arms in hand, the salute prescribed for that arm (sentinels on interior guard duty excepted); without arms, the hand salute.

In civilian dress, covered or uncovered, officers and enlisted men salute military persons with the hand salute.

Officers and enlisted men render the prescribed salutes in a military manner, the junior officer in rank, or the enlisted man saluting first. When several officers in company are saluted, all entitled to the salute return it.

Except in the field under campaign or simulated campaign conditions, a mounted officer (or soldier) dismounts before addressing a superior officer not mounted.

A man in formation does not salute when directly addressed, but comes to attention if at rest or at ease.

Saluting distance is that within which recognition is easy. In general it does not exceed 30 paces.

When an officer entitled to the salute passes in the rear of a body of troops, it is brought to attention while he is opposite the post of the commander.

Soldiers at all times and in all situations pay the same compliments to officers of the *Army, Navy, Marine Corps* and *volunteer forces,* and to officers of the *National Guard* when in uniform, as to officers of their own regiment, corps, or arm of the service.

Saluting Colors. Officers and enlisted men passing the *uncased* colors render honors as follows:—If in uniform they salute; if in civilian dress and covered they uncover, holding the headdress opposite the left shoulder with the right hand; if uncovered they salute with the hand salute.

Sentinels on post doing interior guard duty conform to the foregoing principles, but salute by presenting arms when armed with rifle. They do not salute if it interferes with the proper performance of their duty. Troops under arms salute as prescribed in training regulations.

Passing Troops. Commanders of detachments or other commands salute officers of grade higher than the person commanding the unit by first bringing the command to attention and then saluting. If the person saluted is of a junior or equal grade the unit need not be at attention at the exchange of salutes.

If two detachments or other commands meet, their commanders exchange salutes, both commands being at attention.

Salutes and honors are not paid by troops actually engaged in drill, on the march, or in the field under campaign or simulated campaign conditions. On the march troops may be called to attention. Troops in the service of security pay no compliments whatever.

When in Vehicles and the "Star Spangled Banner" or "To The Colors" is played, all dismount (except the driver of a horse-drawn vehicle) and salute if in uniform or in civilian dress uncovered; if in civilian dress and covered, remove the headdress and hold it opposite the left shoulder.

In automobiles and passing the colors uncased or officers entitled to the salute, officers and enlisted men sit erect and salute except the driver, who sits erect.

In uniform covered or uncovered, but not in formation, officers and enlisted men salute at the playing of "The Star Spangled Banner" or "To the Colors". If in civilian clothes, covered, hold the headdress opposite the left shoulder; if uncovered use the hand salute. (Athletic uniforms are considered civilian dress.)

Salutes with Cannon are fired under charge of commissioned officers, who must be present at the firing and direct it. When one gun is used to fire a salute the interval between discharges is ten seconds.

Salutes are not fired between sunset and sunrise, and not on Sunday unless required by international courtesy. As a rule salutes are fired between 8 A.M. and sunset. The national flag is always displayed at the time of firing.

The national salute is 21 guns. It is also the salute to the national flag.

The salute to the Union consists of one gun for each state and is fired at noon on July 4th, at every station provided with suitable artillery.

A foreign vessel of war entering a harbor, or passing a fortification displays at the main the flag of the country in whose waters it is, and salutes it. The saluting station returns the salute.

The national salute is given as follows:—To the flag. To the President. To an ex-President. At noon on Memorial day. To foreign sovereigns or members of royal families.

Other personal salutes are given as follows:—19 Guns—President of Senate, Cabinet Officers, Ambassadors. 17 Guns—Chief Justice, Speaker of the House, Governors in their own states, Governors General, Congressional committees, The General. 15 Guns—Assistant Secretaries of War and Navy, American or foreign envoys or ministers, Lieutenant General. 13 Guns—Major General. 11 Guns—Brigadier General.

Personal salutes are not fired oftener than once a year unless the person concerned has been advanced in rank. Officers of the Navy are saluted according to their relative rank. Officers of the Marine Corps and volunteer forces are saluted according to rank.

Escorts of Honor.—Escorts of honor may be composed of any or all arms. They are detailed to receive and escort personages of high civil or military rank when they arrive and depart. The troops for this duty are selected for their superior appearance and discipline. In each case the station commander details an officer to attend the personage escorted and to bear communications from him to the commander of the escort.

Funeral Honors.—On the death of an *officer* at a military station the flag is displayed at half staff and so remains, between reveille and retreat, until the last salvo or volley is fired over the grave, or if the remains are not interred at the station, until they are removed therefrom.

During the funeral of an *enlisted man* at a military station the flag is displayed at half staff. It is hoisted to the top after the final gun or volley is fired, or after the remains are taken from the station. The same honors are paid on the occasion of the funeral of a retired enlisted man.

When the flag is displayed at half staff it is lowered to the position from the top of the staff. It is afterward hoisted to the top before being finally lowered.

Minute guns are fired during the funeral of an officer entitled to a salute, followed by a salute according to rank.

Upon the death of the *President of the United States,* one gun is fired every half hour from sunrise to sunset on the day following receipt of notice of his death. The flag is kept at half staff for a stated period and official mourning directed.

The badge of official mourning is a 4 inch band of black crepe or plain cloth worn around the left sleeve, between the elbow and the shoulder. If a sword is worn, a black crepe is worn on the hilt. These are worn at funerals and when prescribed. Family mourning is crepe 4 inches wide around the left arm.

Upon the appearance of the casket from the house or chapel, the commander of the funeral escort calls the escort to attention and commands 1. *Present,* 2. *ARMS,* and the band plays an appropriate air. At the conclusion of the music, arms are brought to the *order.* Other organizations are brought to *attention* and the commanding officer alone salutes.

When the column arrives at the burial ground, the escort is formed in line facing the grave. The remaining elements are conducted as close as practicable to the grave. When the casket is removed from the caisson or hearse the escort *presents arms* and the *band plays* an appropriate air. The casket is carried along the front of the escort and placed over the grave. When the casket is placed over the grave, the escort is brought to the *Order* and the band ceases playing. *Parade rest* is then given and maintained until the conclusion of the services when the escort is called to *attention* and caused to fire *three volleys* of blank cartridges over the grave, muzzles of the pieces raised. *Taps* is then sounded.

At a military funeral, all persons of the military establishment in uniform or civilian clothes, attending in their individual capacity, stand at attention uncovered and hold their headdress over the left breast, while the casket is being carried to and lowered into the grave, while taps is being sounded, and during the services at the grave. During the prayer they also bow their heads. In inclement weather the headdress may be raised and held over the head.

Formal Ceremonies. When a *civil functionary* entitled to a salute arrives at a military station, the commanding officer meets or calls upon him as soon as is practicable, and tenders him a review if the garrison consists of not less than four companies. When a general officer visits a station within his command the troops are paraded for review, unless he directs otherwise.

Compliments from the guard consist in turning out and presenting arms. No compliment is paid between retreat and reveille.

The compliment of the guard is paid:—When the national or regimental colors or standards, not cased, are carried past the guard house by an armed party. To the remains of a deceased officer or enlisted man when passing the guard house. Upon the approach of armed parties, except when at drill, and reliefs and detachments of the guard. To the following individuals upon their approach to the guard house:—All persons entitled to salutes by cannon; Commanding officers of brigades, artillery districts, coast defense commands, or stations, within their respective commands, and the officer of the day.

Flags are kept at the guard house and when they are to be raised they are sent to the staff under a guard of one noncommissioned officer and two privates of the guard. This guard is armed. The noncommissioned officer marches in the middle and carries the flag.

The flag is always raised and lowered from the leeward side of the staff, the halyards being held by two persons.

When lowering and folding the flag no portion of it is allowed to touch the ground. Before being entirely detached from the halyards the flag is folded into the shape of a cocked hat.

On Memorial Day the flag is half-staff from sunrise to mid-day, music is played just before noon, and a 21 gun salute (National) is fired at noon.

On Independence Day there are ceremonies and music before noon, and at noon a Salute to the Union is fired—one gun for every state.

The National Flag, when in company with other flags, such as in the case of national and regimental standards carried by a medical regiment, is always given the honor point and carried on the right.

When flown at a military station or carried by troops the National Flag is never dipped by way of salute or compliment.

When flags are used for decorations they are hung flat, either vertically or horizontally; with the union (blue field and stars) uppermost and to the flag's own right and to the observer's left.

The flag should never be festooned over doorways or arches, used as a desk cover, tied in a bow-knot or fashioned in a rosette.

When displayed with other flags from cross staffs the National Flag is on its own right.

CHAPTER VIII

MILITARY LAW

Introduction. Military law is the legal system that regulates the government of the military establishment. It is a branch of municipal law, and in the United States derives its existence from special constitutional grants of power. It is both written and unwritten. The sources of *written* military law are the Articles of War, enacted by Congress June 4, 1920; other statutory enactments relating to the military service; the Army Regulations; the official Manual for Courts Martial; and general and special orders and decisions promulgated by the War Department and by corps area, department, post and other commanders. The *unwritten* military law is the "custom of war" consisting of customs of the service, both in peace and war.

Articles of War. These form the basis of military discipline. In the U. S. Army they have been in existence in various forms since the Revolutionary War. In adopting the Code of 1920, Congress specifically prescribed that it should be known as the Articles of War and should at all times and at all places *govern the Army of the United States.* Every military offense committed, if it is to be taken cognizance of by courts martial, is charged as a violation of a certain Article of War.

A. W. 110 reads as follows: "Art. 110. Certain Articles To Be Read and Explained.—Articles 1, 2, and 29, 54 to 96, inclusive, and 104 to 109 inclusive, shall be read and explained to every soldier at the time of his enlistment or muster-in, or within six days thereafter, and shall be read and explained once every six months to the soldiers of every garrison, regiment, or company in the service of the United States."

List of A. W. The complete Articles of War embrace the following subjects:

Preliminary Provisions:
- Art. 1. Definitions.
- Art. 2. Persons subject to military law.

Courts-Martial:
- Art. 3. Courts-martial classified.

Composition—
- Art. 4. Who may serve on courts-martial.
- Art. 5. General courts-martial.
- Art. 6. Special courts-martial.
- Art. 7. Summary courts-martial.

By whom appointed—
- Art. 8. General courts-martial.

- Art. 9. Special courts-martial.
- Art. 10. Summary courts-martial.
- Art. 11. Appointment of trial judge advocates and counsel.

Jurisdiction—

- Art. 12. General courts-martial.
- Art. 13. Special courts-martial.
- Art. 14. Summary courts-martial.
- Art. 15. Not exclusive.
- Art. 16. Officers, how triable.

Procedure—

- Art. 17. Trial judge advocate to prosecute; counsel to defend.
- Art. 18. Challenges.
- Art. 19. Oaths.
- Art. 20. Continuances.
- Art. 21. Refusal or failure to plead.
- Art. 22. Process to obtain witnesses.
- Art. 23. Refusal to appear or testify.
- Art. 24. Compulsory self-incrimination prohibited.
- Art. 25. Depositions—when admissible.
- Art. 26. Depositions—before whom taken.
- Art. 27. Courts of inquiry—records of—when admissible.
- Art. 28. Certain acts to constitute desertion.
- Art. 29. Court to announce action.
- Art. 30. Closed sessions.
- Art. 31. Method of voting.
- Art. 32. Contempts.
- Art. 33. Records—general courts-martial.
- Art. 34. Records—special and summary courts-martial.
- Art. 35. Disposition of records—general courts-martial.
- Art. 36. Disposition of records—special and summary courts-martial.
- Art. 37. Irregularities—effect of.
- Art. 38. President may prescribe rules.

Limitations upon prosecutions—

- Art. 39. As to time.
- Art. 40. As to number.

Punishments—

- Art. 41. Cruel and unusual punishments prohibited.
- Art. 42. Places of confinement—when lawful.
- Art. 43. Death sentence—when lawful.
- Art. 44. Cowardice; fraud; accessory penalty.
- Art. 45. Maximum limits.

Action by appointing or superior authority—

- Art. 46. Action by convening authority.
- Art. 47. Powers incident to power to approve.

Art. 48. Confirmation—when required.
Art. 49. Powers incident to power to confirm.
Art. 50. Mitigation or remission of sentences.
Art. 50½. Review; rehearing.
Art. 51. Suspension of sentences of dismissal or death.
Art. 52. Suspension of sentences.
Art. 53. Execution or remission; confinement in disciplinary barracks.

Punitive Articles:

Enlistments; muster; returns—

Art. 54. Fraudulent enlistment.
Art. 55. Officer making unlawful enlistment.
Art. 56. False muster.
Art. 57. False returns—omission to render returns.

Desertion; absence without leave—

Art. 58. Desertion.
Art. 59. Advising or aiding another to desert.
Art. 60. Entertaining a deserter.
Art. 61. Absence without leave.

Disrespect; insubordination; mutiny—

Art. 62. Disrespect toward the President, Vice President, Congress, Secretary of War, governors, legislatures.
Art. 63. Disrespect toward superior officers.
Art. 64. Assaulting or willfully disobeying superior officer.
Art. 65. Insubordinate conduct toward noncommissioned officer.
Art. 66. Mutiny or sedition.
Art. 67. Failure to suppress mutiny or sedition.
Art. 68. Quarrels; frays; disorders.

Arrest; confinement—

Art. 69. Arrest or confinement.
Art. 70. Charges; action upon.
Art. 71. Refusal to receive and keep prisoners.
Art. 72. Report of prisoners received.
Art. 73. Releasing prisoner without proper authority.
Art. 74. Delivery of offenders to civil authorities.

War offenses—

Art. 75. Misbehavior before the enemy.
Art. 76. Compelling commander to surrender.
Art. 77. Improper use of countersign.
Art. 78. Forcing a safeguard.
Art. 79. Captured property to be secured for public service.
Art. 80. Dealing in captured or abandoned property.
Art. 81. Relieving, corresponding with, or aiding the enemy.
Art. 82. Spies.

Miscellaneous crimes and offenses—

Art. 83. Military property—willful or negligent loss, damage, or wrongful disposition.
Art. 84. Waste or unlawful disposition of military property issued to soldiers.
Art. 85. Drunk on duty.
Art. 86. Misbehavior of sentinel.
Art. 87. Personal interest in sale of provisions.
Art. 88. Intimidation of persons bringing provisions.
Art. 89. Good order to be maintained and wrongs redressed.
Art. 90. Provoking speeches or gestures.
Art. 91. Dueling.
Art. 92. Murder—rape.
Art. 93. Various crimes.
Art. 94. Frauds against the Government.
Art. 95. Conduct unbecoming an officer and gentleman.
Art. 96. General article.

Courts of Inquiry—

Art. 97. When and by whom ordered.
Art. 98. Composition.
Art. 99. Challenges.
Art. 100. Oath of members and recorder.
Art. 101. Powers; procedure.
Art. 102. Opinion on merits of case.
Art. 103. Record of proceedings—how authenticated.

Miscellaneous Provisions:

Art. 104. Disciplinary powers of commanding officers.
Art. 105. Injuries to property—redress of.
Art. 106. Arrest of deserters by civil officials.
Art. 107. Soldiers to make good time lost.
Art. 108. Soldiers—separation from the service.
Art. 109. Oath of enlistment.
Art. 110. Certain articles to be read and explained.
Art. 111. Copy of record of trial.
Art. 112. Effects of deceased persons—disposition of.
Art. 113. Inquests.
Art. 114. Authority to administer oaths.
Art. 115. Appointment of reporters and interpreters.
Art. 116. Powers of assistant trial judge advocate and of assistant defense counsel.
Art. 117. Removal of civil suits.
Art. 118. Officers—separation from service.
Art. 119. Rank and precedence among Regulars, Militia, and Volunteers.
Art. 120. Command when different corps or commands happen to join.
Art. 121. Complaints of wrongs.

Manual for Courts-Martial. This is a War Department publication and deals with military law. It defines the law and legal procedure thereunder, and contains directions and forms for purposes of military legal procedure, the executive orders relative to maximum punishments, and the articles of war.

Maintenance of Discipline. All officers and soldiers are required to comply with military law, to obey the lawful orders of their superiors and of those in command. Those in authority are required, furthermore, to compel obedience to laws and regulations governing the army and to assist in their enforcement. For these purposes all officers by virtue of their commissions exercise command over enlisted men. Non-commissioned officers exercise authority by virtue of their *warrants* and by direction of their commanding officers.

Superiors are forbidden to injure those under their authority by tyrannical or capricious conduct, or by abusive language. While maintaining discipline all officers dealing with enlisted men bear in mind the absolute necessity of so treating them as to preserve their self-respect. Military authority is exercised with firmness, kindness, and justice. Punishments conform to law and follow offenses as promptly as circumstances will permit.

Charges and Specifications. A *Charge* corresponds to a civil indictment. The charge designates the alleged crime or offense as a violation of a certain Article of War. *Specifications* set forth the facts constituting the charge, in such detail as clearly to indicate the commission of an offense. All charges are investigated by the Commanding Officer before determining what action is required in the case.

Disciplinary Powers of Commanding Officers. It is not necessary to bring all offenders before a court-martial. The power of command vested in commanding officers, and the specific provisions of A.W. 104 enable commanding officers of detachments, companies, and higher commands to impose disciplinary punishment for minor offenses upon persons of their commands without recourse to court-martial. Such punishments include admonitions, withholding of privileges, extra fatigue, restriction to limits, and hard labor without confinement. Offenders are advised of their rights to request trial and may appeal in writing. A record of such punishments ("*company punishments*") is kept in each organization and is entered in the service record.

Arrest and Confinement. A person arrested is restricted to his quarters or tent unless limits are extended by proper authority. It is customary for enlisted men in arrest to go to the company mess. A person charged with an offense is placed in arrest, but not in confinement unless the offense is a serious one or the commanding officer considers it necessary to hold the accused at the post.

Only the commanding officer can place an officer in arrest except as provided by A.W. 68 (quarrels and disorders). An officer is placed in arrest by his commanding officer in person or through another officer.

All officers have authority to place enlisted men in arrest or confinement. Non-commissioned officers may have delegated to them the authority to arrest enlisted men as a measure of restraint but such act must be reported at once to the company commander.

An officer in arrest cannot exercise command of any kind. He cannot wear a sword nor visit his commanding officer or other superior officially unless directed to do so. His applications and requests of every nature are made in writing.

Warrant officers and non-commissioned officers are not confined with privates if it can be avoided. When in arrest they do not exercise authority; if in confinement they are not sent out to work.

Persons are not placed in irons except in extreme instances of desperate and dangerous characters—a report being made to higher authority.

Deserters may be arrested by civil officers having authority to arrest offenders. The government pays to such officer a reward for the apprehension and delivery to military authority of any deserter. A civilian may, under order or direction of a military officer, arrest a deserter.

General Courts-Martial. *Appointed by*: The President, C. O. territorial division or department, army, army corps, division or separate brigade, and Superintendent Military Academy (for cadets and all persons under him except officers). *Composition*: Not less than 5 officers, a trial judge advocate and one or more assistants when necessary, a defense counsel and one or more assistants when necessary. One member of the court is detailed as Law Member. *Jurisdiction*: Any person subject to military law for any crime or offense made punishable by Articles of War. Any other person not subject to military law who by law is subject to trial by military tribunals for any crime or offense in violation of law of war. *Procedure*: Proceedings and testimony reduced to writing, record prepared in duplicate, signed by president and trial judge advocate and forwarded to officer appointing the court (convening authority). One copy furnished the accused if he desires it. *Limit of Punishment*: Discretionary as limited by: President under A.W. 45; provided that in time of peace period of confinement in penitentiary shall not exceed that prescribed by law; no penitentiary confinement unless convicted of an offense for which civil law prescribes more than one year confinement. Certain restrictions on death penalty.

Special Courts-Martial. *Appointed by*: The C. O. of district, garrison, post or camp, regiment, detached battalion or other detached company. *Composition*: Not less than 3 officers, a trial judge advocate and defense counsel. *Jurisdiction*: Any person subject to military law except those excepted by the President (officers, nurses, etc.) for any crime or offense, not capital made punishable by the Articles of War. (Capital crimes and offenses in peace and war are enumerated in Par. 41, Manual for Courts-Martial). *Procedure*: Similar to that of general court-martial except testimony is not reduced to writing, but a written summary is made. Record disposed of as in General Court-martial. *Limit of Punishment*: Shall not adjudge confinement in excess of 6 months, nor forfeiture of more than two-thirds of pay for 6 months, nor dishonorable discharge.

Summary Courts-Martial. *Appointed by*: C. O. garrison, fort, camp, regiment, detached battalion or company or any other detachment. *Composition*: One officer. *Jurisdiction*: Any person subject to military law, except as noted below, for any crime or offense not capital made punishable by A.W. Exceptions limit the jurisdiction practically to private soldiers and corporals. *Procedure:* Court sits at appointed hour and investigates the case as a representative of the U. S. and of the accused. Proceedings not reduced to writing. Findings and sentence are entered on the charge sheets (triplicate) which are forwarded to appointing officer. *Limit of Punishment:* Shall not adjudge: a. Dishonorable discharge. b. Confinement exceeding one month. c. Forfeiture of pay for more than two-thirds of one month. d. Detention of pay for more than two-thirds of one month. e. Restriction to limits for more than 3 months.

Votes on Findings and Sentence. To impose the death penalty all members of a court must concur. To impose life imprisonment or confinement for more than ten years three-fourths must concur. In all other cases two-thirds must concur.

CHAPTER IX

ARMY REGULATIONS

Introduction. In so vast and ramified an organization as the Army, it is necessary to lay down certain fixed rules and procedures to govern its efficient administration.

Army Regulations prescribe how things shall be done. Whenever a question of administrative procedure arises it is safe to say that if the subject is looked up in AR, the right thing to do will invariably be found there.

It is a custom in the Army always to quote AR in support of any action proposed or taken. In doing so, always check up on your references, so that when the reader consults them he will know precisely just what you have in mind.

Prior to the adoption of the present pamphlet system of Army Regulations we had in circulation several dozen different kinds of documents, all containing basic material governing administrative procedure. Among these were Army Regulations, a bound book of about 400 pages, last published in 1913, and familiarly known, because of its binding, as the "Blue Book". This contained general regulations, greatly epitomized. It was our practice to consult and quote this book on Army Regulations. Frequently in doing so we were informed that paragraph so-and-so of *Compilation of Orders,* or of the *Manual for the Quartermaster Corps,* or of the *Manual for the Medical Department* required additional information "which will be furnished forthwith". In other words, Army Regulations were not Army Regulations because they were incomplete and other supplementary references had to be laboriously sought out before acceptable official action could be taken.

All of these difficulties have been eliminated by the adoption of the new system. All branch manuals and considerable administrative matter heretofore concealed in innocent looking general orders, bulletins, and circulars of the War Department, if they had any fixed value, have been incorporated in AR. On the whole, the volume of administrative material has also been greatly reduced.

General Description. Under the new system all administrative regulations for the military service, whether general or special in character, which are of more or less permanent application, are published in a single system of numbered pamphlets, for filing in a loose-leaf binder. The pamphlets are designated individually and collectively as *Army Regulations.* All non-obsolete material formerly appearing in the Manual for the Medical Department has been carried forward into this new system of AR. The manual has been discarded.

Scope. Every effort is made to have *all matter on the same subject in the same place,* either in a single pamphlet or in a series of pamphlets under specific group headings. An effort is also made to cause all the several parts of the pamphlet system to be arranged in a logical sequence. Duplication is to be avoided. As regards individual pamphlets, each covers fully a subject or sub-division of a subject.

Titles. Each pamphlet exhibits a general title, indicating the general subject and a sub-title, indicating as precisely as practicable the scope and character of the regulations to be found therein; e.g. *Military Education—The Medical Field Service School.*

Numbers. The number of each pamphlet consists of two parts, separated by a dash. The first is the number of the general title and is known as the *base number,* the second is the number of the sub-title and is known as the *sub-number.* For example, the pamphlet entitled "Military Education—The Medical Field Service School" bears the number 350–1030. In this case 350 is the number of the general title, Military Education, and 1030 is the number of the sub-title, The Medical Field Service School. (In the M. D. series, a sub-number above –2000 indicates a veterinary topic.)

Pamphlets are not in any case numbered consecutively, blank numbers being left for future use.

Index. Each pamphlet contains a table of contents. AR 1-10, published at frequent intervals, gives a list of the current pamphlets with their changes and distribution. This AR is a quick reference. In AR 1-5 appears an alphabetical arrangement of all the subjects shown in titles of AR pamphlets and contains more detail than the former.

Eventually a general index to the entire system will be prepared and when at hand will undoubtedly popularize the new system. One of the difficulties at present, during what may be termed the transition period of its development, is finding the right regulation. A general index will remedy this.

Changes. To obviate the necessity of reprinting an entire pamphlet every time a change is needed, a *Change* showing specific reference to a certain pamphlet is published separately, and upon receipt should immediately be filed with the original pamphlet. Likewise, when a pamphlet is ready for reprint, it is brought up to date by such further changes as may be desired.

In checking over your regulations always note the date of the pamphlet in AR 1-10, in order to be sure that you have the latest pamphlet on the subject.

Filing. AR pamphlets should be kept in the loose-leaf binders supplied free of charge by the government, and filed immediately upon receipt. All individuals and offices should see to it that their files are kept complete and up to date. They are allowed considerable latitude as to just how the regulations should be assembled in each binder for ready use. Ordinarily one binder will contain everything one needs in the ordinary course of the daily routine.

Lastly, just a word of caution—make it a practice to file your pamphlets promptly; don't put off this work to another day, leaving your pamphlets lie around on the top of your desk, or in desk drawers, where they are apt to be forgotten or eventually lost to your files. You are supposed to have in your possession all the pamphlets indicated in the distribution list, and when an *Inspector* happens along it is quite likely that he will ask to see your file and look it over as to completeness.

Distribution. For purposes of fixing allowances and facilitating distribution, AR are divided into four classes viz. A, B, C, and D. The significance of these symbols and the method of supply and distribution is covered in AR 310-200.

List of AR. The following is a list of the Army Regulations now in circulation, of general or special interest to the Medical Department:

No. of Pamphlet	Title of Pamphlet
	Army Regulations:
1-5	Alphabetical Arrangement of Subjects shown in Titles of Published Army Regulation Pamphlets.
1-10	List of Current Pamphlets and Changes; Distribution.
1-15	General Provisions.
	Assistant Secretary of War:
5-5	General Duties.
	General Staff:
10-15	Organization and General Duties.
	Adjutant General's Department:
15-5	General Provisions.
	Inspector General's Department:
20-5	General Provisions.
20-25	Reports and Memorandums of Inspections, and Reports of Remedial Action.
20-30	Investigations.
20-35	Inspection of Property for Condemnation.
	Judge Advocate General's Department:
25-5	General Provisions.
	Quartermaster Corps:
30-5	General Provisions.
30-450	Public Animals.
30-480	Forage for Public Animals, General.
30-490	Forage for Officers' Mounts.
30-500	Animal Transportation, General.
30-910	Transportation Requests.
30-920	Transportation of Individuals.
30-925	Sleeping Car and Similar Accommodations.
30-930	Transportation of Troops; General.
30-935	Transportation of Troops; Railway Equipment.
30-940	Transportation of Troops; Preparation and Listing of Property for Shipment.

No. of Pamphlet	Title of Pamphlet
30-945	Transportation of Troops; Entraining, Duties En Route, and Detraining.
30-950	Bills of Lading.
30-955	Transportation of Supplies.
30-960	Transportation of Baggage.
30-965	Transportation of Animals.
30-1075	Operation of Motor Vehicles.
30-1105	Water Transportation—General Provisions.
30-1110	Ports of the Army Transport Service.
30-1115	Transports in Port.
30-1150	Medical and Dental Service on Transports.
30-1190	Embarkation of Troops on Transports.
30-1195	Transportation of Individuals on Transports.
30-1200	Transportation of Casuals on Transports.
30-1205	Secrecy of Troop Movements Overseas.
30-1210	Baggage and Effects on Transports, Customs Requirements.
30-1230	Conduct of Passengers on Transports.
30-1235	Routine of Passengers on Transports.
30-1245	Debarkation of Troops from Transports.
30-1255	Transportation of Supplies, Property, and Mail on Transports.
30-1285	Transportation of Animals on Transports.
30-1410	Real Estate; General Provisions.
30-1435	Construction.
30-1475	Heating Systems—Stoves and Ranges.
30-1515	Water-Supply Systems.
30-1580	Fire Prevention and Fire Fighting.
30-1620	Standard Quantities of Heat, Light, and Electric Power.
30-1660	Refrigeration.
30-1670	Incinerators.
30-1675	Railroads.
30-1680	Roads and Walks.
30-1685	Clearing, Draining, and Improving of Grounds.
30-1710	Sewerage Systems.
30-1805	Graves Registration—General.
30-1810	Burials on Field of Battle.
30-1815	Reports of Burials.
30-1820	Disposition of Remains.
30-1825	Disinterment of Remains.
30-1830	Preparation for Burial and Shipment.
30-2110	Salvage and Laundry Activities; General Provisions.
30-2120	Field Printing.
30-2135	Laundries.
30-2145	Unserviceable Property, Including Waste Material.
30-2175	Collection and Disposal of Kitchen Waste, Garbage, Manure, Dead Animals, and Miscellaneous Refuse.
30-2200	Classification of Subsistence Stores.
30-2210	Rations.
30-2290	Sale of Subsistence Articles.
30-2310	Sales Commissary Units.
30-2720	Typewriters and Similar Office Labor-Saving Devices.
30-3000	Clothing Money Allowance and Price List of Clothing and Equipage.
30-3050	Size Tariffs of Clothing.
	Finance Department:
35-5	General Provisions.
35-120	Disbursing Officers and Public Funds, General.
35-140	Public Funds, How Kept.
35-150	Advances of Public Funds under Subsistence Expense Act of 1926.
35-160	Transfers and Exchanges of Public Funds.
35-180	Accounting for Public Funds.
35-200	Public Funds, Miscellaneous.
35-320	Agent Officers.
35-600	Lost, Stolen, or Destroyed Official Checks.
35-780	Proceeds of Sales which Must Be Deposited to the Credit of the Treasurer of the United States.
35-820	Payments of Expenses and Refunds in Connection with Sales of Public Property.
35-840	Procurement Authorities, General.

No. of Pamphlet	Title of Pamphlet
35-860	Interbranch Procurements.
35-1020	Money Records, and Accounts, General.
35-1160	Administrative Examinations of Money Accounts.
35-1320	General Provisions Relating to Pay of Military Personnel.
35-1340	How Time Computed in Payment of Personnel.
35-1360	Pay Accounts of Officers, Warrant Officers, Members of the Army Nurse Corps, and Contract Surgeons.
35-1380	Collection of Delinquent Quartermaster Accounts.
35-1400	Pay and Allowances during Authorized Absences.
35-1420	Unauthorized Absence as Affecting Pay and Allowances.
35-1440	Loss of Pay during Absence due to Misconduct.
35-1500	Pay for Distinguished-Service Awards.
35-1520	Burial Expenses of Military Personnel and Civilian Employees.
35-1540	Gratuity upon Death.
35-1620	Pay of Officers; General Provisions.
35-1640	Pay of Officers, Rates.
35-1680	Pay of Commissioned Officers—Longevity Pay.
35-1720	Pay for Mounts.
35-1920	Pay of Contract Surgeons.
35-2020	Pay and Allowances of Army Nurses and Hospital Matrons.
35-2220	Pay of Warrant Officers.
35-2320	Payments to Enlisted Men; General Provisions.
35-2340	Pay of Enlisted Men; Rates of Pay.
35-2360	Pay of Enlisted Men; Longevity Pay.
35-2400	Pay of Enlisted Men; Specialist Rating.
35-2420	Pay of Enlisted Men; Enlistment Allowance.
35-2440	Stoppages Against Pay of Enlisted Men.
35-2460	Court-Martial Forfeitures—Enlisted Men.
35-2480	Payment of Enlisted Men upon Separation from the Service.
35-2520	Payment of Clothing Money Allowance for Enlisted Men.
35-2560	Travel Pay of Enlisted Men.
35-2600	Soldiers' Deposits.
35-3420	Pay and Allowances, Organized Reserves.
35-3520	Pay and Allowances, Reserve Officers' Training Corps.
35-3820	Pay of Civilian Employees, General Provisions.
35-3840	Rates of Pay for Civilian Employees.
35-4220	Subsistence and Rental Allowances for Commissioned Officers, Warrant Officers, Members of the Army Nurse Corps, and Contract Surgeons.
35-4520	Monetary Allowances in Lieu of Rations and Quarters for Enlisted Men.
35-4540	Reimbursement of Traveling Expenses of Enlisted Men.
35-4880	Official Routes and Distances.
35-4890	Travel Orders for Mileage, Laws and Regulations Governing.
35-4910	Travel Allowances of Members of the Army Nurse Corps.
35-5320	Money Allowance, Transportation of Dependants.
35-5520	Allotments of Pay, General.
35-5540	Making, Changing, Discontinuing, and Renewing Allotments of Pay by Persons other than Civilian Employees.
35-5560	Sentences by Court-Martial and Changes in Status of Allotters other than Civilian Employees.
35-5600	Payment of Allotments of Pay.
35-6520	Property Accountability and Responsibility.
35-6540	Requisitioning Property.
35-6560	Receipt, Shipment, and Issue of Property.
35-6620	Expendable Property.
35-6640	Lost, Destroyed, Damaged, or Unserviceable Property.
35-6660	Sales of Property.
35-6680	Transfers of Property Accountability.
35-6700	Property Records.
35-6720	Blank Forms Pertaining to Property Accounting.
35-6740	Property Auditing.
35-7020	Claims against the United States, General Provisions.
35-7080	Claims for Property Damaged or Wrongfully Taken by Persons Subject to Military Law.
35-7100	Claims of Military Personnel for Private Property Lost, Damaged, or Destroyed in the Military Service.

No. of Pamphlet	Title of Pamphlet
35-7120	Claims of Military Personnel and Civilian Employees for Reimbursement of Payments from Private Funds.
	Medical Department:
40-5	General Provisions.
40-10	The Medical Corps--General Provisions.
40-15	Dental Corps—General Provisions.
40-20	The Army Nurse Corps—General Provisions.
40-30	Contract Surgeons.
40-75	Ambulances—General Provisions.
40-80	Medical Department Board.
40-100	Standards of Miscellaneous Physical Examinations.
40-105	Standards of Physical Examination for Entrance into the Regular Army, National Guard, and Organized Reserves.
40-110	Standards of Physical Examination for Flying.
40-205	Military Hygiene and Sanitation.
40-210	The Prevention of the Communicable Diseases of Man—General.
40-215	The Prevention of the Communicable Diseases of Man—Immunization.
40-220	The Prevention of the Communicable Diseases of Man—Diseases of the Respiratory System and Other Diseases Transmitted by Discharges from the Respiratory Tract.
40-225	The Prevention of the Communicable Diseases of Man—Intestinal Diseases.
40-230	The Prevention of the Communicable Diseases of Man—Insect-Borne Diseases.
40-235	The Prevention of the Communicable Diseases of Man—Venereal Diseases.
40-240	The Prevention of the Communicable Diseases of Man—Miscellaneous Diseases.
40-245	The Prevention of Communicable Diseases of Man—Management of Cases in Hospitals and Dispensaries.
40-270	The Medical Inspector (Heretofore Known as Sanitary Inspector).
40-275	Sanitary Reports.
40-305	Corps Area and Department Laboratories.
40-310	The Collection and Preparation of Pathological and Other Specimens for Shipment to Laboratories.
40-405	The Army Medical Library.
40-410	The Army Medical Museum.
40-505	Medical Attendance—General Provisions.
40-510	Dental Attendance.
40-550	Dispensaries—General Provisions.
40-580	Hospitals—General Provisions.
40-585	Construction and Repair of Fixed Hospitals and Quarters for Medical Department Noncommissioned Officers in Time of Peace.
40-590	The Administration of Hospitals, General Provisions.
40-600	General Hospitals—General Provisions.
40-605	The Army and Navy General Hospital.
40-610	The Fitzsimons General Hospital.
40-1005	Reports, Returns, and Records.
40-1010	Dental Reports, Returns, and Records.
40-1025	The Report of Sick and Wounded.
40-1030	The Register of Sick and Wounded.
40-1035	Standard Terms for Diagnoses.
40-1040	Standard Terms for Anatomical Locations.
40-1045	Standard Terms for Operations.
40-1050	The Transfer Card.
40-1055	The Emergency Medical Tag.
40-1060	The Field Medical Record.
40-1065	Abbreviations for Use on Emergency Medical Tags and Field Medical Records.
40-1070	Clinical Records and Indexes.
40-1075	Index to Regulations Regarding Records of Sick and Wounded.
40-1080	Current Statistical Reports, Tables, and Charts.
40-1195	The Identification Record.
40-1705	Medical Supplies, General Provisions.
40-1710	Supply Table and Price List, Medical Supplies.
40-2005	Veterinary Service, General Provisions.
40-2010	Duties and Titles of Veterinary Officers.

No. of Pamphlet	Title of Pamphlet
40-2015	Department and Corps Area Veterinarians.
40-2025	Attending Veterinarians.
40-2030	Employment and Compensation of Civilian Veterinarians.
40-2035	Veterinary Station Service.
40-2045	Veterinary Service, Remount Purchasing and Breeding Headquarters.
40-2050	Veterinary Service, Remount Purchasing Boards.
40-2055	Veterinary Service, Ports of Embarkation and Debarkation.
40-2060	Veterinary Service, Animal Transports.
40-2065	Veterinary Hospitals.
40-2070	Veterinary Hospital Rules.
40-2075	Physical Examinations of Animals.
40-2080	Veterinary Sanitation.
40-2085	Veterinary Forage Inspection.
40-2090	Communicable Diseases of Animals, General.
40-2095	Communicable Diseases of Animals, Disinfection.
40-2100	Communicable Diseases of Animals, Glanders.
40-2105	The Ophthalmic Mallein Test of Animals.
40-2110	The Intradermic Mallein Test of Animals.
40-2115	Communicable Diseases of Animals, "Shipping Fever."
40-2125	Communicable Diseases of Animals—Mange.
40-2130	Communicable Diseases of Animals, Surra.
40-2135	Communicable Diseases of Animals, Dermatitis Gangrenosa.
40-2140	Veterinary Laboratory Service.
40-2145	Material for Veterinary Laboratory Examination.
40-2150	Veterinary Meat and Dairy Hygiene, General.
40-2155	Veterinary Ante-Mortem Inspections.
40-2160	Veterinary Post-Mortem Inspections, General.
40-2165	Veterinary Post-Mortem Inspections, Cattle and Calves.
40-2170	Veterinary Post-Mortem Inspections, Sheep and Goats.
40-2175	Veterinary Post-Mortem Inspections, Swine.
40-2180	Veterinary Products Inspections, General.
40-2185	Veterinary Products Inspections, Fresh Products.
40-2190	Veterinary Products Inspections, Eggs and Sea Foods.
40-2195	Veterinary Products Inspections, Cured Products.
40-2200	Veterinary Products Inspections, Canned Products.
40-2205	Veterinary Products Inspections, Sausages, etc.
40-2210	Veterinary Products Inspections, Lards and Oleomargarin.
40-2215	Veterinary Products Inspections, Butter.
40-2220	Veterinary Products Inspections, Cheese.
40-2225	Veterinary Inspections of Establishments.
40-2230	Veterinary Dairy Inspections.
40-2235	Veterinary Reports, Returns and Records.
40-2240	Veterinary Statistical Reports.
40-2245	Register and Report of Sick and Wounded Animals.
40-2250	Veterinary Diagnostic Nomenclature.
40-2255	Veterinary Sanitary Reports.
40-2260	Veterinary Meat and Dairy Hygiene, Record and Report.
40-2265	Physical Examination of Animals, Record and Report.
40-2270	Veterinary Health Certificate and Memoraundum.
	Ordnance Department:
45-5	General Provisions.
	Chemical Warfare Service:
50-5	General Provisions.
	Chaplains:
60-5	General Provisions.
	Chiefs of Combatant Branches:
70-5	General Provisions.
	Infantry:
75-10	Infantry Board.
75-60	Tank Board.
	Cavalry:
80-10	Cavalry Board.
	Field Artillery:
85-10	The Field Artillery Board.
	Coast Artillery Corps:
90-20	Coast Artillery Board.

No. of Pamphlet	Title of Pamphlet
	Air Corps:
95-5	General Provisions.
95-15	Aircraft, General.
95-20	Air Corps Board.
	Corps of Engineers:
105-5	General Provisions.
100-15	Maps and Mapping.
	Signal Corps:
105-5	General Provisions.
105-10	Signal Corps Board.
105-15	Signal Communications, General.
105-255	Photography; Photographs.
105-260	Training Films—General.
105-265	List of Current Training Films.
105-270	Care and Use of Training Films.
	Mobilization:
120-10	Man Power for Military Purposes.
	National Guard:
130-10	Call and Draft into Federal Service.
	The Organized Reserves:
135-10	General Principles.
	Officers' Reserve Corps:
140-5	Reserve Officers not General Officers nor Federally Recognized Members of the National Guard.
140-10	Members of the National Guard Below the Grade of General Officer.
140-21	Minimum Professional Qualifications for Appointment and Standard Specifications for Promotion.
140-33	Medical Department.
140-35	Military Police Corps.
	Reserve Officers' Training Corps:
145-10	Administration and Training.
145-20	Supply and Equipment.
145-30	Training Camps.
170-10	**Corps Areas, Departments, and the District of Washington.**
	Posts, Camps and Stations:
210-50	Unit and Other Similar Funds.
210-65	Exchanges.
210-70	Commanding Officers.
210-80	Development and Conservation of Wild Life on Military Reservations.
210-100	Post Restaurants.
210-390	Motion Picture Service.
210-500	Post Cemeteries.
	Regiments:
235-5	General Provisions.
	Battalions:
240-5	General Provisions.
	Companies:
245-5	General Provisions.
	Bands:
250-5	General Provisions.
	Flags, Colors, Standards, and Guidons:
260-10	Description and Use.
265-10	**Tactical and Training Inspections.**
	Military Publications:
310-50	Orders, Bulletins, Circulars, and Memoranda.
310-200	War Department Publications, Including Binders Therefor, and Blank Forms (A. G. O.); Allowance and Distribution of.
310-235	Army Register and Army List and Directory.
310-245	Printing and Binding.
	Documents:
330-5	"Secret," "Confidential," and "For Official Use Only."
	Correspondence:
340-10	Penalty Envelopes and Labels; Use of the Mails.
340-15	How Conducted.

No. of Pamphlet	Title of Pamphlet
	Military Records:
345-10	Custody and Maintenance; Personnel Sections.
345-25	Duty Rosters.
345-50	Strength Returns, General.
345-55	Basic Strength Returns, and Record of Events.
345-75	Soldier's Deposit Book and Report of Soldier's Deposits.
345-80	Consolidated Strength Returns.
345-100	The Diary.
345-105	Historical Records and Histories of Organizations.
345-125	Service Record.
345-150	Pay Card.
345-155	Preparation of Army Pay Rolls and Model Remarks.
345-300	Statement of Charges.
345-400	Morning Reports.
345-415	Daily Sick Report.
345-465	Notification of Discharge.
345-470	Discharge Certificate.
345-475	Final Statement.
345-620	Correspondence Book and Document File.
345-800	Reports of Changes, Reports of Casualties, and Memoranda of Transmittal.
345-900	Monthly Rosters.
345-1000	Records and Reports for Qualification in Arms.
	Military Education:
350-5	General Provisions (Basic).
350-105	General and Special Service Schools—Designations, Locations, Organizations.
350-110	General and Special Service Schools, General Provisions.
350-580	The School of Aviation Medicine.
350-920	The Quartermaster Corps Motor Transport School.
350-940	Schools for Bakers and Cooks.
350-1000	The Army Medical School.
350-1010	The Army Dental School.
350-1020	The Army Veterinary School.
350-1030	The Medical Field Service School.
350-1400	The Army Music School.
350-2200	Citizens' Military Training Camps.
350-2505	Post Schools.
	Employment of Troops:
500-50	Enforcement of the Laws.
500-60	Relief Work by the War Department, in Cases of Flood, Fire, Earthquake, or Other Great Catastrophe.
	Personnel:
600-10	Military Discipline.
600-15	Rank and Precedence.
600-20	Command.
600-25	Salutes and Ceremonies.
600-30	Honors to Persons.
600-35	The Prescribed Uniform.
600-40	Wearing of the Uniform.
600-45	Award and Supply of Decorations for Individuals.
600-65	Award and Supply of Service Medals, except Initial Supply of the Victory Medal.
600-85	Purpose of, and Supply of, Service Ribbons, Bronze Stars, Minatures, and Label Buttons.
600-95	Authority for Wearing, and Supply of, Wound and War Service Chevrons.
600-100	Life Insurance.
600-200	Passports.
600-355	Arrest and Confinement, General.
600-375	Prisoners, General Provisions.
600-500	Care and Disposition of the Insane.
600-550	Deceased.
600-600	Designation of Beneficiaries.
600-750	Recruiting for the Regular Army.
	Commissioned Officers:
605-10	Appointment in Medical Corps, Regular Army.

No. of Pamphlet	Title of Pamphlet
605-15	Appointment in Dental Corps, Regular Army.
605-20	Appointment in Veterinary Corps, Regular Army.
605-25	Appointment in Medical Administrative Corps, Regular Army.
605-50	Promotion in Medical, Dental, and Veterinary Corps, Regular Army, General Provisions.
605-55	Subjects of Professional Examination for Promotion in Medical Corps, Regular Army.
605-60	Subjects of Professional Examination for Promotion in Dental Corps, Regular Army.
605-65	Subjects of Professional Examination for Promotion in Veterinary Corps, Regular Army.
605-70	Promotion Boards for Medical, Dental, and Veterinary Corps, Regular Army.
605-75	Boards of Review for Medical, Dental, and Veterinary Corps, Regular Army.
605-110	Maintenance of, and Tests for, Physical Fitness.
605-115	Leaves of Absence and Delays.
605-120	Personal Reports; Registration.
605-125	Visits of Courtesy.
605-130	Mounted Officers; Mounts, General.
605-135	Specifications and Requirements for Private Mounts.
605-145	Transfers, Details, and Assignments.
605-175	Foreign Service.
605-180	Traveling on Duty.
605-185	Efficiency Reports.
605-245	Retirement.
605-250	Army Retiring Boards.
605-275	Resignation.
	Warrant Officers:
610-5	General Provisions.
	Enlisted Men:
615-15	Appointment and Reduction of Non-commissioned Officers and Privates, First Class, Medical Department.
615-20	Rating and Disrating of Specialists, Medical Department; Medical, Dental, and Veterinary Services.
615-30	Army Serial Numbers.
615-40	Clothing: Allowances, Accounts, and Disposition.
615-210	Foreign Service.
615-250	Physical Inspections.
615-275	Furloughs, Passes, and Delays.
615-290	Absence Without Leave.
615-300	Deserters.
615-360	Discharge.
615-395	Retirement.
615-400	Soldiers' Home.
	Miscellaneous:
850-5	Marking of Clothing, Equipment, Vehicles, and Property.
850-20	Standard Specifications for Marking Shipments.
850-25	Types of Equipment Used by the United States Army.
850-50	Inventions and Patents.
850-75	Employment of the American National Red Cross.
850-125	Fitting of Shoes and Socks.
850-150	Authorized Abbreviations.

CHAPTER X

TRAINING REGULATIONS

Introduction. The principles stated in discussing Army Regulations apply with equal force to Training Regulations. Units cannot render efficient service without a standardized method of training.

Until the adoption of the present pamphlet system practically every branch of the Service had its own Drill Regulations and technical manuals for the training of its personnel. There were Infantry Drill Regulations, Cavalry Drill Regulations, and for the Medical Department a small book known as *"Drill Regulations and Service Manual for Sanitary Troops."* In publishing such documents considerable duplication was necessary. Moreover, any appreciable number of changes in the text necessitated a new edition of the book. Now, under the present loose-leaf system, all one has to do is to discard an obsolete pamphlet and substitute for it one that has been brought up to date.

General Description. War Department publications pertaining to training consist, as a general rule, of three series of publications: Training Regulations, Technical Regulations, and Training Manuals.

Training Regulations consists of a series of pamphlets containing only those regulations which have to do solely with the training of a tactical unit, or an individual as a member of a tactical unit, and replace publications heretofore known as Drill and Combat Regulations.

Technical Regulations, not yet fully developed, will consist of a series of pamphlets containing regulations of a technical nature such as descriptions of, instructions for the care of, instructions for the handling of, and the proper nomenclature of, arms, materiel, and equipment of the various branches. Technical regulations will be numbered in the same manner as are Training Regulations, but 1000 will be added to the general subject numbers; i.e., Training Regulations will appear as TR 405-40 and Technical Regulations as TR 1075-75.

The *Training Manual* series will comprise a group of text-books for individual specialists and where deemed necessary will contain intructions for instructors.

When further developed the system now contemplated will necessitate a rearrangement of the material already produced by the Medical Department and that now in process of completion.

The scope, titling, system of numbering, indexing, filing, and changing Training Regulations are practically identical with those laid down for Army Regulations.

Distribution. For purposes of fixing allowances and facilitating distribution, TR are divided into eight lettered classes, viz. A, B, C, D. E, F, G, and X, and twelve numbered sub-classes, viz. 1 to 12 inclusive. The significance of these letter and number symbols, and the method of supply and distribution, is covered in TR 1-10.

The system of distribution contemplates of course that every individual who requires a training publication shall have it. Copies of all training publications are issued to general officers. Copies of all TR except those of a highly technical nature are issued to field officers. Copies of such of the training publications of their respective branches and those of other branches as may be required in their training are issued to officers below field grade.

Commanders of active organizations are issued sufficient copies of such of the training publications of their respective branches and those of other branches as may be necessary to supply the noncommissioned officers of their organizations for training. They are held responsible that the noncommissioned officers keep their files complete. The publications issued for this purpose remain with the organization and do not become the personal property of the noncommissioned officers.

List of TR. The following is a list of the Training Regulations, Technical Regulations, and Training Manuals now in circulation, of general or special interest to the Medical Department, and also those pamphlets proposed and now being developed by the Medical Department:

No. of Pamphlet	Title of Pamphlet
	Training Regulations:
1-10	List of Training Regulations, Technical Regulations, and Training Manuals Published to Date and Distribution Thereof.
	Doctrines, Principles, and Methods:
10-5	Basic.
	The Soldier:
50-15	Instruction Dismounted without Arms.
50-20	Instruction Dismounted with Rifle and Automatic Rifle.
50-45	Instruction Mounted without Arms.
50-80	The Infantry Pack.
50-90	The Display of Equipment, Foot Troops.
	Specialists:
75-15	The Color Sergeant and Standard Bearer.
75-85	The Motor Vehicle Operator.
	First Aid:
112-5	Outlines of First Aid for the Injured or Sick.
	Hygiene:
113-5	Principles of Personal Hygiene.
	The Band:
130-5	Organization, Duties, and Musical Instruction.
130-10	Formation, Movements, Inspections, etc., Dismounted.
130-15	Formations, Movements, Inspections, etc., Mounted and Dismounted.
	Guard Duty:
135-5	Ceremony of Guard Mounting, Foot Troops.
135-15	Interior Guard Duty.
	Marksmanship:
150-25	Pistol, Mounted.
	Chemical Warfare Service:
155-5	Defense against Chemical Warfare.

No. of Pamphlet	Title of Pamphlet
160-5	**Signal Communication for all Arms.**
162-5	**Visual Signaling.**
165-5	**Wire Axis Installation and Maintenance within the Division.**
	Topography and Surveying:
190-5	Map Reading.
190-10	Conventional Signs.
190-14	Drafting, Basic.
190-15	Military Sketching.
190-20	Panoramic Sketching.
190-24	Tracing.
190-25	Topographic Drafting.
190-27	Aerial Photographic Mapping.
	Fortification:
195-40	Camouflage for All Arms.
	Military Intelligence:
210-5	Combat Intelligence Regulations.
	Tent Drill:
225-5	To Pitch and Strike Shelter Tents, Foot Troops.
225-10	To Pitch and Strike Shelter Tents.
225-15	To Pitch, Strike, and Fold Common, Wall, and Pyramidal Tents.
225-35	Pitching, Striking, and Folding of Hospital Tentage, the Ward Tent.
	Equipment:
300-50	Field Ranges, Description, Care, and Use.
	Weapons:
320-10	United States Rifle, Caliber .30 (Model of 1903), Accessories and Appendages.
320-15	Automatic Pistol, Caliber .45, Model of 1911.
	Animals:
360-5	Care of Animals.
	Transportation:
380-10	Animal-drawn.
	Medical Department:
405-40	Regimental Medical Detachment.
405-50	The Litter.
405-60	The Ambulance (Animal-Drawn and Motor).
405-80	The Ambulance (Airplane).
405-90	The Field Litter Carrier, Model of 1921.
	Infantry:
420-20	Dismounted Ceremonies.
420-40	Drill and Combat Signals.
420-45	Drill, General Introduction.
420-50	Drill, the Rifle Squad, Platoon, and Company.
420-60	Drill, the Infantry Batallion.
420-65	Drill, the Headquarters Companies, Infantry Battalion, Regiment, and Brigade.
420-70	Drill, the Service Company, Infantry Regiment.
420-80	Drill, the Infantry Regiment and Brigade.
420-100	Development of Offensive Combat.
420-120	Combat Principles—The Rifle Company.
420-160	Combat Principles—The Infantry Battalion.
420-170	Combat Principles—The Infantry Regiment.
420-180	Combat Principles—The Service Company, Infantry Regiment.
420-185	Combat Principles—The Infantry Brigade.
	Cavalry:
425-15	General Principles and Definitions.
425-20	Drill and Combat Signals.
425-50	The Cavalry Squadron.
425-55	The Cavalry Regiment.
425-75	The Cavalry Machine-Gun Troop.
425-80	The Cavalry Machine-Gun Squadron.
425-85	The Cavalry Brigade.
425-130	Ceremonies and Inspections.
	Field Artillery:
430-105	Tactical Employment of Field Artillery.

No. of Pamphlet	Title of Pamphlet
	Coast Artillery Corps:
435-30	Tactical Employment of Antiaircraft Artillery (Includes Machine Guns, Guns, and Searchlights).
435-120	Antiaircraft Regiment (Artillery).
435-161	Identification of Aircraft.
435-300	The Coast Defense Command.
	Air Corps:
440-15	Fundamental Principles for the Employment of the Air Corps.
	Corps of Engineers:
445-15	Duties and Relations of Engineer Troops.
445-215	Stream Crossing Expedients.
445-235	Portable Footbridges.
	Technical Regulations.
	Specialists:
1075-75	The Wagoner.
	Topography and Surveying:
1190-26	Mechanical Drafting.
1190-50	Surveying Tables.
	Transportation:
1380-20	Dog Transportation.
	Air Corps:
1440-65	The Airplane.
	Training Manuals.
The Army Baker.	
The Chaplain, His Place and Duties.	
The Saddler.	
	Proposed Medical Department TR.
405-10	Minimum Specifications.
405-100	Drill, Ceremonies and Inspections.
405-500	Command and Staff Duties of the Medical Department
405-550	The Collecting Company.
405-560	The Collecting Battalion.
405-570	The Ambulance Company, Motor and Animal-drawn.
405-590	The Ambulance Battalion.
405-600	The Hospital Company.
405-610	The Hospital Battalion.
405-620	The Service Company
405-630	The Medical Regiment.
405-710	The Collecting Troop.
405-720	The Ambulance Troop.
405-730	The Hospital Troop.
405-740	The Medical Squadron.
405-2040	The Veterinary Detachment.
405-2090	The Veterinary Ambulance.
405-2100	The Leading Apparatus.
405-2630	The Veterinary Company.
405-2740	The Veterinary Troop.
405- —	The Surgical Hospital.
405- —	The Evacuation Hospital.
405- —	The Convalescent Hospital.
405- —	The Medical Section of a Regulating Station.
405- —	The Hospital Train.
405- —	The Medical Department Concentration Center.
405- —	The Auxiliary Surgical Group.
405- —	The General Dispensary.
405- —	The Medical Laboratory, Aviation.
405- —	The General Hospital, C.Z.
405- —	The Station Hospital, C.Z.
405- —	The Hospital Center.
405- —	The Medical Laboratory Service.
405- —	The Medical Supply Service.
405- —	The Veterinary Evacuation Hospital.
405- —	The Veterinary Convalescent Hospital.
405- —	The Veterinary General Hospital.
405- —	The Veterinary Station Hospital.

No. of Pamphlet	Title of Pamphlet
405- —	The Laboratory Technician.
405- —	Preventive Medicine in the Field.
405- —	The X-Ray Photographer.
405- —	The Veterinary Technician.
405- —	The Dental Technician.

TR for the Medical Detachment. As Medical Detachments outnumber by far all other units of the Medical Department combined, the majority of the readers of this handbook are interested in detailed information on the operations of the Detachment. Accordingly, there is reproduced on pages 153 to 189 following, the complete text, word for word, and figure for figure, of the official training regulation (TR 405-40) on this subject. This reproduction also serves well as a sample of the form and character of training regulations.

Note: When next revised TR 405-40 will probably show the Detachment as consisting of the following sections: Headquarters section, 1st battalion section, 2nd battalion section, 3rd battalion section, and a veterinary section.

TRAINING REGULATIONS No. 405–40.
WAR DEPARTMENT, WASHINGTON, *March 1, 1926.*

MEDICAL DEPARTMENT

REGIMENTAL MEDICAL DETACHMENT

Prepared under direction of
The Surgeon General

Paragraphs
SECTION I. General — 1–9
II. Organization — 10–14
III. Employment in garrison and on the march — 15–16
IV. General employment in combat — 17–26
V. Employment in particular forms of combat — 27–29
VI. Employment with units other than infantry — 30–32

SECTION I

GENERAL

Paragraph
Object — 1
Composition — 2
Use of terms — 3
Function and control, general — 4
Equipment — 5
Interior economy — 6
Drills, ceremonies, reviews, and inspections — 7
Training — 8
Duties of commissioned personnel — 9

1. Object.—The object of these regulations is to standardize the training of medical detachments and to outline the duties they may be called upon to perform. For Training Regulations regarding the veterinary detachment see TR 405–2040.

2. Composition.—A medical detachment is composed of commissioned and enlisted personnel of the Medical Department in such numbers and grades as are available and provided for in Tables of Organization; or, in case no approved Table of Organization exists, of such Medical Department personnel as may be assigned by proper authority.

3. Use of terms.—*a.* The term "regiment" is used to designate a tactical or administrative unit composed of 2 or more battalions or their equivalent.

b. The term "medical detachment" as used in these regulations designates the group of Medical Department personnel attached to the regiment or to a smaller administrative unit.

c. The term "medical wagon" includes either an escort wagon or an ambulance on which the field medical set is being transported.

4. Function and control, general.—*a.* The medical detachment exists solely for the service of the troops to which it is attached, its mission being to conserve the fighting strength of those troops.

b. For purposes of administration and control a medical detachment is a unit of the regiment or other organization it serves.

5. Equipment.—For individual and organization equipment, see Tables of Equipment.

6. Interior economy.—*a.* The interior economy (including pay, supply, reports, records, etc.) of a medical detachment conforms to that of similar organizations of other branches of the service and is governed by the same regulations.

b. In the field the medical detachment normally messes with the organization to which attached. When troops are not on the march and when practicable it is preferable that the regimental medical detachment mess as a unit. When troops are on the march or in combat the regimental medical detachment ordinarily messes as follows: The headquarters medical detachment with the headquarters company; the battalion or squadron medical section with the headquarters company, battery, or troop of the battalion or squadron to which attached; company, battery, or troop aid men with the company, battery, or troop which they are serving.

7. Drills, ceremonies, reviews, and inspections.—*a.* Dismounted drill for medical detachments will in so far as practicable conform to the provisions of TR 420-50. In all foot drill, medical detachments attached to regiments of artillery and cavalry will be governed by paragraph 22*h*, TR 420-50. Litter drill will be conducted in accordance with the provisions as set forth in TR 405-50. Ambulance drill will be conducted in accordance with the provisions as set forth in TR 405-60 and 405-80.

b. In all formations of the Infantry regiment except "column of squads" the medical detachment attached thereto will be disposed of in accordance with the provisions of paragraph 4*b*, TR 420-80.

c. The normal formation for the detachment dismounted will be the "assembly formation." (See pls. 1 and 2.)

NOTE.—When the medical detachment falls in for any purpose whatsoever the assembly formation is used. The headquarters medical detachment is on the right and the medical sections are formed in line to the left. If the detachment is to proceed with drill the command ***Form for drill*** is given and the detachment immediately reforms in accordance with the formations for drill as set forth in Plate 1. Smaller detachments form in a similar manner. Plate 2 shows the formation of the detachment with a Cavalry regiment. Further adaptation may be necessary for other detachments.

d. The normal formation of the medical detachment for inspection is the assembly formation. Ranks are opened and the detachment is inspected in accordance with the provisions of TR 50-90 and paragraphs 597-602, Infantry Drill Regulations, 1919.

e. Litters are not carried by medical detachments participating in ceremonies, reviews, or inspections.

8. **Training.**—*a*. The detachment commander is responsible for all training of the detachment in accordance with the instructions of the regimental commander and of these regulations.

b. All training will conform to the principles, doctrines, and methods of training prescribed in TR 10-5.

c. The detachment commander prepares training programs covering definite periods for the systematic and progressive training of the detachment and its subunits, including—

(1) The training cycle or period covered by the program, and subperiods for the detachment, if any.

(2) The mission or final training objective for the detachment as a whole, and the date by which it is to be attained.

(3) The methods of instruction to be employed.

(4) The training to be conducted by the detachment commander, by his subordinates, and by the organization to which attached.

(5) The training objectives or standards of proficiency to be reached in each subject.

(6) The order in which subjects are to be taken up in order to insure logical and progressive training.

(7) Complete and accurate text reference for each subject.

(8) The detailed arrangements for troop (unit) schools, including subjects, text, instructors, and place (par. 49, TR 10-5)

(9) Name of instructor for each subject.

(10) Necessary instructions for the conduct of each training inspection and test.

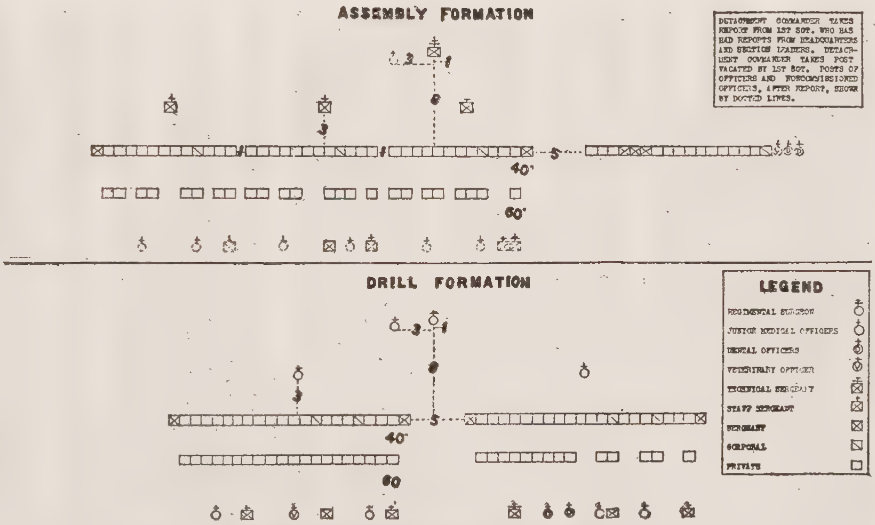
(11) Instructions to subordinates for preparing and submitting subschedules which are to be incorporated into the detachment schedule.

(12) The inspection calendar for training tests and inspections.

d. He prepares the weekly detachment schedule showing all the training activities of the detachment.

TR 405–40

MEDICAL DEPARTMENT



DETACHMENT COMMANDER TAKES REPORT FROM 1ST SGT. WHO HAS HAD REPORTS FROM HEADQUARTERS AND SECTION LEADERS. DETACHMENT COMMANDER TAKES POST VACATED BY 1ST SGT. POSTS OF OFFICERS AND NONCOMMISSIONED OFFICERS, AFTER REPORT, SHOWN BY DOTTED LINES.

Plate 1.—Formation, medical detachment, infantry regiment

Note.—Figures signify paces except where inches are indicated

TR 405-40

REGIMENTAL MEDICAL DETACHMENT

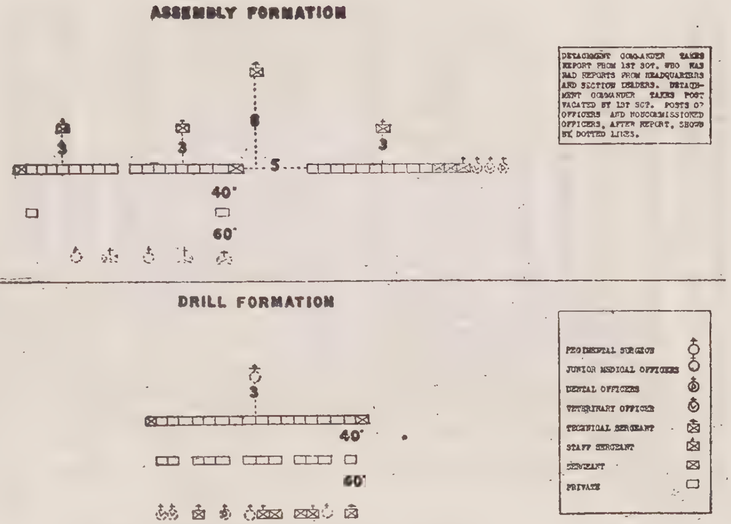


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PLATE 2.—Formation, medical detachment, cavalry regiment

NOTE.—Figures signify paces except where inches are indicated *e*. He closely supervises all training conducted by his subordinates and assures himself that the provisions of the training program are being fully carried out.

f. The training of the detachment is divided into—

(1) *Basic military training.*

- (*a*) Knowledge of Army Regulations and orders pertaining to enlisted men.
- (*b*) Military courtesies and customs of the service.
- (*c*) Uniform regulations.
- (*d*) Exercises for physical development.
- (*e*) Care of quarters.
- (*f*) The soldier dismounted (TR 50–15).
- (*g*) The school of the squad (Sec. I, TR 420–50).
- (*h*) The platoon (TR 420–45; Sec. II, TR 420–50).
- (*i*) The company (Sec. III, TR 420–50).
- (*j*) Guard duty (TR 135–5).
- (*k*) Tent pitching (shelter) and camp expedients (TR 225–5).
- (*l*) Marches and march discipline.
- (*m*) Training in (*f*), (*g*), and (*h*) may be given by the organization to which attached, when practicable.

(2) *Technical training.*—The technical training of the medical detachment includes all of the special training and instruction required for its administration and to enable it to perform the technical services for which it is organized. The technical training of the medical detachment includes the following:

- (*a*) The organization, equipment, and functions of the detachment in garrison, on the march, in camp, and in combat.
- (*b*) Enlisted specialists (AR 615–20).
- (*c*) Elementary anatomy, first aid, splints and splinting, and the medical emergency tag and its use.
- (*d*) Chemical warfare, gas defense, and the first-aid treatment of gas casualties.
- (*e*) Litter drill (TR 405–50).
- (*f*) Ambulance drill (TR 405–60 and 405–80).
- (*g*) Equitation (TR 50–45).
- (*h*) Care and handling of animals, driving (TR 360–5 and 380–10).
- (*i*) Elementary hygiene and sanitation; fly, mosquito, louse, flea, bug, and tick borne diseases and their prevention, including disinfestation; sanitary devices for camps.

(*j*) Elementary instruction in materia medica, pharmacy, minor surgery, nursing, and ward management.
(*k*) Heavy tent pitching.
(*l*) Military map reading and simple sketching.
(*m*) Communications: Agencies and means of communication available to the medical detachment; communication agents, runners, and other messengers; field message books, uses; preparation of messages, transmission, and receiving.

(3) *Tactical training.*—The tactical training of the medical detachment includes knowledge of the normal dispositions of the Infantry regiment (or other unit to which attached) in march column, and as advance, flank, and rear guard, and the corresponding dispositions of the medical detachment; dispositions of the medical detachment in bivouacs of the regiment; tactical dispositions of the regiment in combat, and corresponding dispositions of the elements of the medical detachment; reconnaissance and selection of positions for aid stations; establishment and maintenance of close contact and constant communications with the organization to which attached; night operations, including the occupation of regimental and battalion aid stations, and establishment of contact and communications with the units to which attached and between the regimental aid station and the battalion aid stations; artillery, machine-gun, and rifle fire, and gas, as they affect the movements and positions of aid stations in combat; construction of shelter for regimental and battalion aid stations; maintenance of medical supplies during combat; normal relation of collecting stations to aid stations.

g. Officers.—Officers are trained in administration; field hygiene and sanitation; military law; combat principles of arms to which attached; field orders; sketching and map reading to include aerial photographs; reconnaissance, close and battle; and field fortifications.

9. Duties of commissioned personnel.—*a.* The senior medical officer present commands the detachment and is the surgeon of the regiment. He serves in both an advisory and administrative capacity. In general, his duties are as follows:

(1) To serve on the staff of the regimental commander and to advise that officer in matters of medical and sanitary importance, all advice given or recommendations made to be in accord with the policies of higher medical authority.

(2) To supervise all training of the detachment.

(3) To instruct, at suitable times designated by the commanding officer, the entire personnel of the regiment in personal hygiene, field sanitation, and first aid.

(4) To provide care and treatment for the sick and wounded.

(5) To make sanitary inspections as are required by AR 40-270, and such additional inspections as may from time to time be necessary, directed, or authorized. In connection therewith he supervises the methods of purification of the water supply, the sanitation of kitchens, the methods of disposal of garbage and waste water, the sanitation of latrines and urinals and the filling in and marking of the same when discontinued, the sanitation of bathing places and picket lines, measures taken for the destruction of flies and mosquitoes, and other sanitary procedures necessary to preserve the health of the command.

(6) To make timely requisitions for all necessary equipment, including medical, dental, and veterinary supplies.

(7) To organize the medical detachment and plan the work of this unit so as to insure the accomplishment of its mission with the least possible disturbance to the combatant force which it serves. Such organization of the attached medical troops and such plans as he may make for their tactical employment are as simple as is consistent with the accomplishment of its mission. Dispositions for combat or march and location of medical establishments must have the approval of the organization commander or the appropriate staff officer acting in his name before being put into effect.

(8) To keep such records and render such reports and returns as may be required.

b. The assistant regimental surgeon is an officer of the Medical Corps, usually with the rank of captain or first lieutenant. In general his duties are such as may be assigned to him from time to time by the surgeon.

(1) He acts for and in the name of the surgeon during that officer's absence from the command.

(2) He may be detailed to supervise the preparation of reports and returns, the preparation of requisitions for supplies, and the issue of such supplies to sections of the medical detachment.

(3) He may be placed in charge of the regimental dispensary and of the regimental aid station as it may be established. Under the supervision of the surgeon, he may be detailed to hold sick call and continue the training of the personnel of the headquarters medical detachment.

c. Battalion and squadron surgeons.—The senior medical officer, usually a captain, assigned to duty with any battalion or squadron of the regiment is the battalion or squadron surgeon. In general his duties within the battalion or squadron are analogous to the duties of the regimental surgeon within the regiment. (See subpar. *a.*)

d. Assistant battalion or squadron surgeons.—The assistant battalion or squadron surgeon is a commissioned officer of the Medical Corps assigned to duty with the battalion or squadron by the regimental surgeon. In general the assistant battalion surgeon's duties in the battalion or squadron are analogous to the duties of the assistant regimental surgeon in the regiment. (See subpar. *b.*)

e. Dental officers.—Dental officers of the detachment are subordinate to the senior medical officer of the command and under his immediate control. In the interior organization of the detachment dental officers are usually included in the headquarters and assigned to duty with separate battalions or squadrons of the regiment by the surgeon whenever he considers such assignment necessary. In general their duties are as follows:

(1) Under the direction and supervision of the surgeon, they are responsible for the dental care of the command. This includes the instruction of the entire personnel of the command in oral hygiene, the making of oral inspections to determine whether or not the command is practicing oral hygiene, the making of dental surveys to determine the amount and character of dental work to be done, and the accomplishment of this work in its order of importance to the command and to the individual.

(2) The establishment and operation of the dental service of dispensaries.

(3) During combat they assist the regimental, battalion, or squadron surgeons, and in the absence of a medical officer may serve as regimental or battalion or squadron surgeon.

(4) The diagnosis, care, and treatment of dental and facial injuries received in combat.

(5) Keeping of records and rendering of such reports and returns as may be required by higher authority.

f. Veterinary officers.—Veterinary officers are subordinate to the senior medical officer of the command and are under his immediate supervision and control. Their duties being regimental in character, they are included in the headquarters of the medical detachment. (See TR 405-2040.)

SECTION II

ORGANIZATION

	Paragraph
General	10
The medical detachment with Infantry	11
The medical detachment with Artillery	12
The medical detachment with Cavalry	13
The medical detachment with other branches	14

10. General.—*a. Headquarters, medical detachment.*—(1) The medical detachment headquarters normally consists of the regimental and assistant regimental surgeon, the dental and veterinary surgeons, and such enlisted personnel as the surgeon may deem necessary.

(2) Under the authority of the regimental commander the headquarters medical detachment supervises the medical service of the regiment. It is organized to provide an administrative, supply, and communication service for the separate medical sections operating with battalions or squadrons; for the establishment, when necessary, and maintenance of regimental aid stations and dispensaries; for the care and treatment of troops located in the vicinity of regimental headquarters; and for the direction and supervision of the dental and veterinary services of the regiment.

b. Sections.—(1) Each section will consist of the battalion or squadron surgeon, the assistant battalion surgeon, dental and veterinary officers when attached, and available enlisted personnel.

(2) In general, the total enlisted strength of any section should be approximately twice the strength of the medical detachment headquarters.

(3) The medical section is organized to function as a tactical medical unit, serving battalions or squadrons. Medical sections are numbered from 1 up within their respective detachments. Sections of a given numerical designation should be assigned to function with battalions or squadrons of a like numerical designation.

11. The medical detachment with Infantry.—*a.* The medical detachment with an Infantry regiment is divided into a medical detachment headquarters and 3 medical sections.

b. The medical detachment headquarters consists of the regimental surgeon, the assistant regimental surgeon, dental and veterinary officers, a technical sergeant, 2 sergeants, 1 corporal, and about one-fifth of the privates, first class, and privates. In general, their duties are as follows:

(1) *The regimental surgeon.*—See paragraph 9.

(2) *The assistant regimental surgeon.*—See paragraph 9.

(3) *Dental officers.*—Dental officers may, when necessary, be assigned to medical sections for the accomplishment of dental work within the battalion to which the section is attached, or as assistants to the battalion medical officers. (See par. 9.)

(4) *Veterinary officers.*—See TR 405–2040.

(5) *Noncommissioned officers.*

- (*a*) The technical sergeant is first sergeant of the medical detachment. He attends to the routine administrative details of the regimental surgeon's office.
- (*b*) One sergeant is a property and mess sergeant. One is a sergeant (veterinary).
- (*c*) One corporal, noncommissioned officer, is in charge of the regimental aid station or dispensary.

(6) *Privates, first class, and privates.*

- (*a*) Approximately 7 privates, first class, or privates as wagoners, clerks, cooks, litter bearers, dressers, messengers, motorcyclists, and orderlies.
- (*b*) Approximately 4 privates, first class, or privates (veterinary).

c. Each medical section consists of the battalion surgeon, the assistant battalion surgeon, 1 staff sergeant, 1 sergeant, 1 corporal, and approximately 19 privates, first class, or privates. The medical section is further divided into an aid station squad, a litter-bearer squad, and a company aid squad.

(1) The aid station squad consists of 1 staff sergeant, 1 sergeant, 1 corporal, and 3 privates, first class, or privates. The staff sergeant is in charge of the enlisted personnel and is also a surgical assistant and dresser. The sergeant is in charge of property, exchange of medical and surgical supplies, water purification, and the preparation of food for patients. The corporal is an assistant dresser, has charge of the sterilization of instruments, the giving of antitetanic serum and other hypodermic medication (under the immediate supervision of the medical officer in charge of the station). One private, first class, or private is assigned to clerical duties. He prepares and keeps the station blotter, which gives all the required information concerning the cases which pass through the aid station. One private, first class, or private is in charge of the battalion medical wagon and transportation of the section. He cares for all animals, and when not fully occupied with these duties assists in the work of the aid station. One private, first class, or private is a general utility man and is used wherever he is most needed.

(2) The litter-bearer squad consists of 8 privates, first class, or privates. In camp or garrison this squad is chiefly employed in and about the battalion dispensary or station hospital. In combat their function is that of litter bearers.

(3) A company aid squad consists of 8 privates, first class, or privates, 2 being assigned to each combatant company as dressers and first-aid men.

d. The transportation and equipment for the detachment is as provided in Tables of Organization and Tables of Basic Allowances. Mounts are ordinarily provided for the following personnel:

(1) *Headquarters medical detachment.*—The regimental surgeon, assistant regimental surgeon, the veterinary officer, 1 technical sergeant, 3 staff sergeants, and 1 orderly.

(2) *Each medical section.*—The battalion surgeon, assistant battalion surgeon, and 2 orderlies.

The medical equipment which is provided for each regimental or battalion dispensary is carried in 1 medical wagon (total wagons in the regiment, 4). One additional wagon is provided for the entire regimental medical detachment for baggage, forage, and so forth.

12. The medical detachment with Artillery.—*a.* The medical detachment with an Artillery regiment is divided into a medical detachment headquarters and 2 or 3 medical sections, depending upon the number of battalions in the regiment.

b. The medical detachment headquarters consists of the regimental surgeon, the assistant regimental surgeon, dental and veterinary officers, a technical sergeant, 1 staff sergeant, 2 sergeants, and approximately 14 privates, first class, or privates. The assignments and duties of commissioned and enlisted personnel of an Artillery regiment are analogous to the assignments and duties of like personnel in the medical detachment headquarters with an Infantry regiment.

c. Each medical section consists of a battalion surgeon, an assistant battalion surgeon, 1 staff sergeant, 1 sergeant, 1 corporal, and approximately 12 privates, first class, or privates. The medical section is divided into an aid station squad and a battery aid squad.

(1) The duties of battalion and assistant battalion surgeons with battalions of Artillery are analogous to the duties performed by such officers serving with battalions of Infantry.

(2) The aid station squad consists of 1 staff sergeant, 1 sergeant, 1 corporal, and 6 privates, first class, or privates (approximately). The organization of the aid station and the assignment of personnel to duties therein are analogous to such action of an aid station for an Infantry battalion.

13. The medical detachment with Cavalry.—*a.* The medical detachment with a Cavalry regiment is divided into a medical detachment headquarters and 2 medical sections.

b. The medical detachment headquarters normally consists of the regimental surgeon, dental and veterinary officers, 1 technical sergeant, 1 staff sergeant, 2 sergeants, and approximately 12 privates, first class, or privates.

c. Each medical section (2 in number) normally consists of the squadron surgeon, 1 staff sergeant, 1 sergeant, and approximately 8 privates, first class, or privates. The medical section is divided into an aid station squad and a troop aid squad.

The duties of the personnel of a medical section with Cavalry are analogous to those of personnel assigned to a medical section with Infantry.

14. The medical detachment with other branches.—The basic principles of interior organization as herein set forth for medical detachment serving with Infantry, Artillery, and Cavalry will, in so far as is practicable, be followed in the interior organization of medical detachments serving with other tactical units.

SECTION III

EMPLOYMENT IN GARRISON AND ON THE MARCH

	Paragraph
In garrison	15
On the march	16

15. In garrison.—*a. General.*—(1) The principal functions of the regimental medical detachment in garrison are: Training, sanitary inspections, and the operation of dispensaries.

(2) Regiments ordered from the field to garrison will ordinarily be accompanied by their medical detachments. In large garrisons, where one or more dispensaries are required, personnel from the regimental medical detachments are assigned to duty at the station hospital in such numbers as are necessary to meet the hospitalization requirements. In garrisons where all of the necessary medical service can be rendered by the station hospital the entire regimental medical detachments are assigned to duty at the station hospital. Instructions governing the operation of station hospitals are found in AR 40-590.

b. Training.—See paragraph 8.

(1) Practical training in the care of sick is accomplished by assigning selected enlisted men to duty at the station hospital.

(2) In addition to training peculiar to the Medical Department, the medical detachment participates in practice marches, maneuvers, and like training being conducted by the combatant force to which it is attached.

c. Sanitation of stations and permanent camps.—(1) Sanitary procedures utilized in a permanent station or camp are in general such as will modify and adapt the sanitary environment to the needs of the troops rather than the temporary or expedient measures which may be used to protect the health of the command while in the field.

(2) The duties of the medical detachment in connection with sanitation are inspectorial and advisory.

d. Dispensaries will be conducted as specified in AR 40-550.

16. On the march.—*a. Function.*—The medical service on the march concerns itself with the care and evacuation of march casualties.

b. Duties of medical officers.—(1) Prior to the march the commanding officer of the medical detachment obtains from the regimental commander his instructions as to the day's march and communicates to his subordinates such instructions as he may deem necessary for their information and guidance. He inspects the detachment as to its preparedness for participation in the march, giving particular attention to the condition of men, animals, transportation, and equipment.

(2) During the march medical officers dispose of march casualties and conduct the march of troops under their direct command.

c. March casualties.—(1) Sick or disabled soldiers are ordinarily reported to the commanding officer of the unit by their squad leader. The commanding officer usually directs the soldier to see the medical officer at the next halt or issues a pass for the soldier to drop out of the column and await the arrival of a medical officer. The medical officer who examines the soldier returns this pass to the soldier's company commander, showing thereon the disposition which he has made of the case. The medical officer disposes of the case in accordance with the conditions found upon hurried examination. He may relieve the soldier of his pack and require him to continue the march; he may put him in an ambulance for disposition at the end of the march, or on any other piece of transportation if there is no ambulance attached to the organization; or he may require him to march at the end of the column, where he can be kept under observation. In case the march order provides for march collecting posts, casualties are continued with the column until the next station is reached. If an evacuation point only is designated, casualties unable to continue with the column are left by the roadside or delivered to ambulances in the rear for evacuation. All casualties separated from their organization are plainly tagged by a medical officer. All arms and personal equipment of sick or disabled foot soldiers remain with them; the mount, saddle equipment, and arms of mounted soldiers are returned to their organizations.

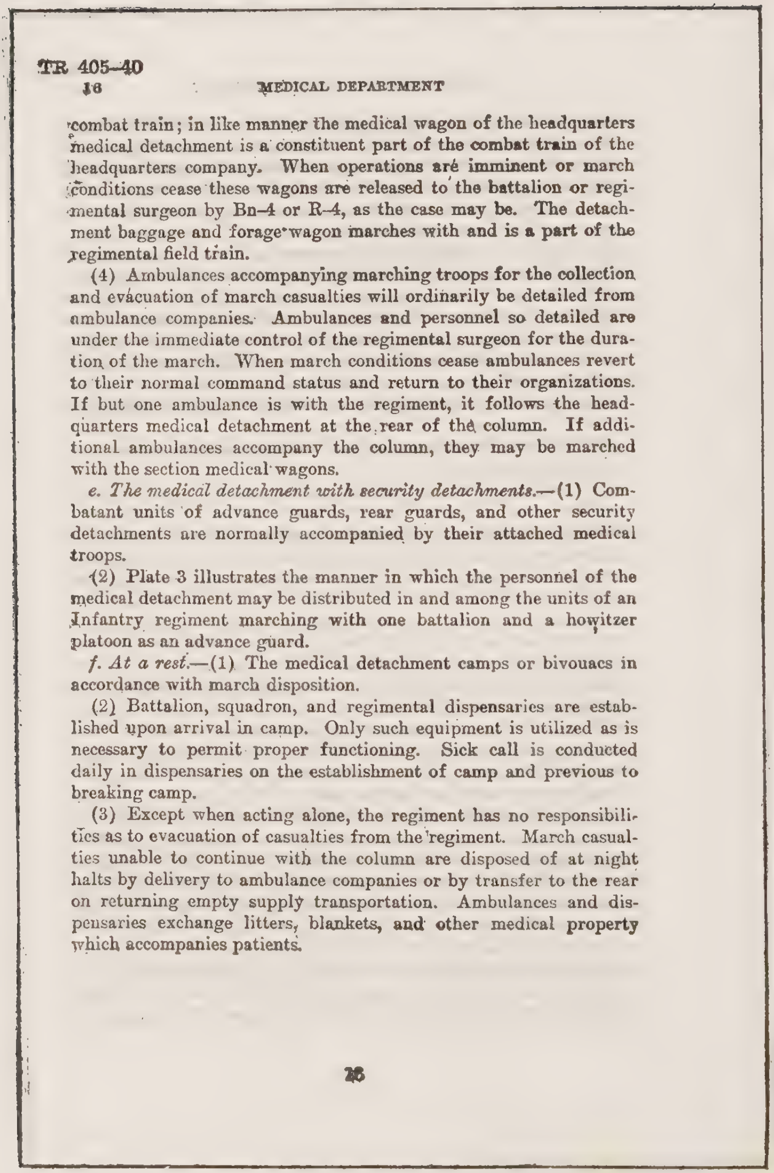
(2) Rapidly moving mounted commands, except when supplied with ambulances, rarely have transportation for the sick and disabled. March casualties unable to continue with the column may be directed to follow the command at a walk or they may be sent back toward the main body. It may be necessary to leave them with inhabitants or under shelter, to be picked up and evacuated to the rear by following troops. In all cases it must be left to the judgment of medical officers whether casualties should be attended by personnel of the medical detachment.

(3) Medical officers keep a record of the disposition made of sick and disabled soldiers.

d. Disposition of the detachment for the march.—(1) The medical detachment is disposed in the column as directed by the regimental commander. The regimental surgeon, accompanied by his mounted orderly, usually marches with that part of the staff which accompanies the regimental commander. The assistant regimental surgeon marches with the headquarters medical detachment, the position of the latter in column being determined by the orders issued for the march. Dental officers march with the headquarters medical detachment when not assigned to medical sections. The veterinary personnel of the headquarters medical detachment marches with the regimental field train.

(2) Battalion and squadron surgeons, accompanied by their mounted orderlies, march with the battalion or squadron commander. Assistant battalion or squadron surgeons march at the rear of the battalion or squadron and at the head of their respective medical sections. When there is but one medical officer with the battalion or squadron he marches at the rear of the battalion or squadron column, going forward when necessary for the purpose of making contact with and gaining information from the commanding officer. Company, battery, and troop aid men march with the battalion section, except that when contact with the enemy is expected they march with their assigned companies. The remaining personnel of the section marches at the rear of the battalion or squadron column.

(3) Medical wagons carrying the field medical sets of medical sections while so marching are a constituent part of the battalion



combat train; in like manner the medical wagon of the headquarters medical detachment is a constituent part of the combat train of the headquarters company. When operations are imminent or march conditions cease these wagons are released to the battalion or regimental surgeon by Bn-4 or R-4, as the case may be. The detachment baggage and forage wagon marches with and is a part of the regimental field train.

(4) Ambulances accompanying marching troops for the collection and evacuation of march casualties will ordinarily be detailed from ambulance companies. Ambulances and personnel so detailed are under the immediate control of the regimental surgeon for the duration of the march. When march conditions cease ambulances revert to their normal command status and return to their organizations. If but one ambulance is with the regiment, it follows the headquarters medical detachment at the rear of the column. If additional ambulances accompany the column, they may be marched with the section medical wagons.

e. The medical detachment with security detachments.—(1) Combatant units of advance guards, rear guards, and other security detachments are normally accompanied by their attached medical troops.

(2) Plate 3 illustrates the manner in which the personnel of the medical detachment may be distributed in and among the units of an Infantry regiment marching with one battalion and a howitzer platoon as an advance guard.

f. At a rest.—(1) The medical detachment camps or bivouacs in accordance with march disposition.

(2) Battalion, squadron, and regimental dispensaries are established upon arrival in camp. Only such equipment is utilized as is necessary to permit proper functioning. Sick call is conducted daily in dispensaries on the establishment of camp and previous to breaking camp.

(3) Except when acting alone, the regiment has no responsibilities as to evacuation of casualties from the regiment. March casualties unable to continue with the column are disposed of at night halts by delivery to ambulance companies or by transfer to the rear on returning empty supply transportation. Ambulances and dispensaries exchange litters, blankets, and other medical property which accompanies patients.

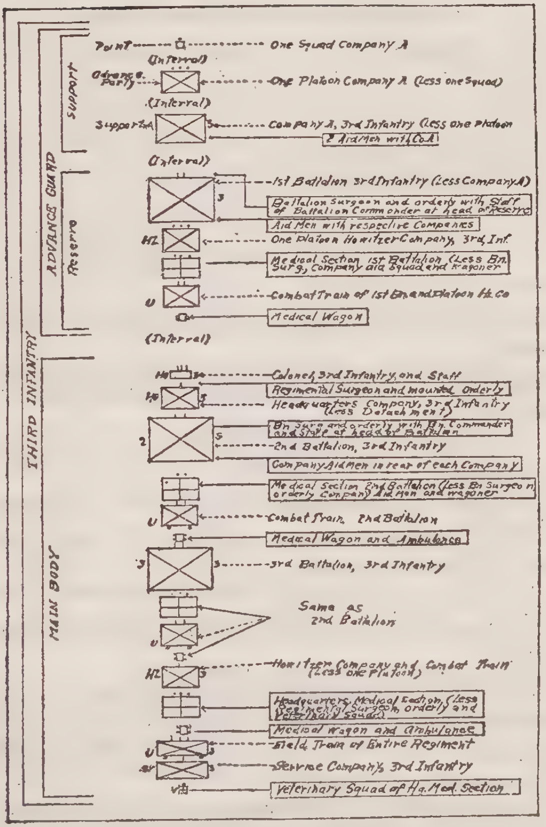

THIRD INFANTRY
ADVANCE GUARD
Support
Point
One Squad Company A
(Interval)
Advance Party
One Platoon Company A (Less one Squad)
(Interval)
Support Co. A
Company A, 3rd Infantry (Less one Platoon
2 Aid Men with Co. A
(Interval)
Reserve
1st Battalion 3rd Infantry (Less Company A)
Battalion Surgeon and orderly with Staff of Battalion Commander at head of Reserve
Aid Men with respective Companies
HI
One Platoon Howitzer Company, 3rd Inf.
Medical Section 1st Battalion (Less Bn. Surg., Company aid squad and wagoner
U
Combat Train of 1st Bn and Platoon Hq. Co
Medical Wagon
(Interval)
MAIN BODY
Colonel, 3rd Infantry, and Staff
Regimental Surgeon and mounted orderly
Hq
Headquarters Company, 3rd Infantry (Less Detachment)
2
Bn Surg and orderly with Bn. Commander and Staff at head of Battalion
2nd Battalion, 3rd Infantry
Company Aid Men in rear of each Company
Medical Section 2nd Battalion (Less Bn Surgeon n orderly Company Aid Men and wagoner
U
Combat Train, 2nd Battalion
Medical Wagon and Ambulance
3
3rd Battalion, 3rd Infantry
Same as 2nd Battalion
U
HI
Howitzer Company and Combat Train (Less one Platoon)
Headquarters Medical Section, (Less Regimental Surgeon, orderly and Veterinary Squad)
Medical Wagon and Ambulance
U
Field Train of Entire Regiment
Service Company, 3rd Infantry
Veterinary Squad of Hq. Med. Section

PLATE 3.—Distribution of medical detachment on the march

SECTION IV

GENERAL EMPLOYMENT IN COMBAT

Paragraph
General considerations 17
Reconnaissance 18
Casualties 19
Orders 20
Zone of action 21
Aid stations 22
Functions of litter-bearer squad 23
Functions of company aid men 24
Contact 25
Veterinary aid station 26

17. General considerations.—*a.* In general the principles herein set forth govern the tactical management of all medical detachments serving with combatant troops.

b. The tactics employed by the combatant units constitute the determining factor in the tactics to be employed by attached medical troops.

c. All tactics as employed by medical detachments in the field have as their object the rendering of support and assistance to the combatant troops.

d. Support and assistance is rendered by—

(1) The finding, tagging, sorting, and separation of the disabled from the able.

(2) The establishment of aid stations, the collection and treatment of casualties.

(3) The prevention of unnecessary movement to the rear on account of sickness or injury.

(4) Aiding in the preservation of morale by early medical attention and removal of the wounded.

(5) Examination of the dead and sanitary supervision of their disposal.

(6) Preparation of records of dead and wounded.

e. The surgeon, in order to accomplish the above, must be informed concerning his mission, the military situation, the plan and time of action, zones of action, and the terrain. This knowledge is obtained by contact and orders from his combatant commander, through reconnaissance, and by maps.

18. Reconnaissance.—Reconnaissance on the part of officers is necessary for the efficient management of the medical service in the field. All medical officers should endeavor to make a reconnaissance of the area occupied or to be occupied by their organizations, and to gather such information concerning the territory to the immediate front and rear of their areas as will enable them to hastily prepare plans for the collection, treatment, and evacuation of the sick and wounded in case of a general advance or retreat. Regimental surgeons who find it impossible to complete such a reconnaissance because of insufficient time or of limitations imposed by the enemy should, after battalion medical officers have established their aid stations, make a reconnaissance and suggest to battalion commanders the desirability of any changes. The reconnaissance as made by medical officers is topographical in character and generally is conducted for the purpose of obtaining the following information:

What to look for	*Why.*
General character of country	Orientation.
High ground	For observation points, or to avoid or take shelter behind.
The road net	For routes of evacuation to rear.
Ravines and stream beds, trails, etc.	For determination of the natural lines of drift of wounded
Cover { Brush Woods Ravines Stream lines	For shelter from observation and fire; for location of aid stations.

19. Casualties.—*a. Classification of casualties.*

First classification	Second classification	Third classification
(*a*) Communicable:		
1. Sick	Slight	Walking.
(*b*) Noncommunicable:		
2. Gassed	Medium	Transportable (lying, sitting).
3. Wounded	Severe	Nontransportable.
4. Killed		

b. Estimation of battle casualties.

Classification	Open operations	Stabilized operations
	Per cent	*Per cent*
Dead	15	20
Wounded	85	80
Able to walk to aid stations	45	40
Must be carried to aid stations	40	40

An estimate of battle casualties is necessary in order that proper plans may be made for their collection, treatment, evacuation, and replacement.

On any battle day a front-line regiment of Infantry will have approximately 1 per cent sick added to battle casualties, which average about 10 per cent, but may, however, run as high as 40 per cent.

c. In estimating probable casualties the following points must be kept in mind:

(1) Battle casualties are not ordinarily equally distributed along the front.

(2) The percentage of casualties in certain battalions and companies will be greater than in the regiment as a whole.

(3) Attacking troops usually have greater casualties than defending troops.

(4) In the attack the greatest casualties will occur in units having the more difficult missions.

(5) In the defense the greatest casualties will occur in units holding strategic points.

(6) Heavy casualties usually occur at stream crossings, road crossings, road and railway junctions, and in locations which permit enemy observation.

20. Orders.—The orders of surgeons to subordinates are ordinarily in the form of messages and verbal instructions. For details as to the sending of messages see TR 420–105.

21. Zone of action.—*a.* The zone of action of the regimental medical detachment or subdivision thereof is the same as the zone of action of the combatant unit served.

b. Frontages and depth.—See Plate 4.

22. Aid stations.—The regimental aid station has the same function as the battalion aid station, but it is not generally a second echelon in the evacuation of wounded. When it is not necessary to establish the regimental aid stations, as is often the case, the personnel of the headquarters section of the regimental medical detachment may be held in reserve.

a. Functions.

(1) Reception and recording of casualties.

(2) Examination, dressing, or redressing of wounded.

(3) Temporary shelter when practicable.

(4) Administration of antitetanic serum, narcotics, hot drinks, or food.

(5) The delivery of casualties to collecting station personnel.

b. Principles for establishment and operation of aid stations.

(1) Aid stations are established in combat when there is no steady progress or when progress is very slow.

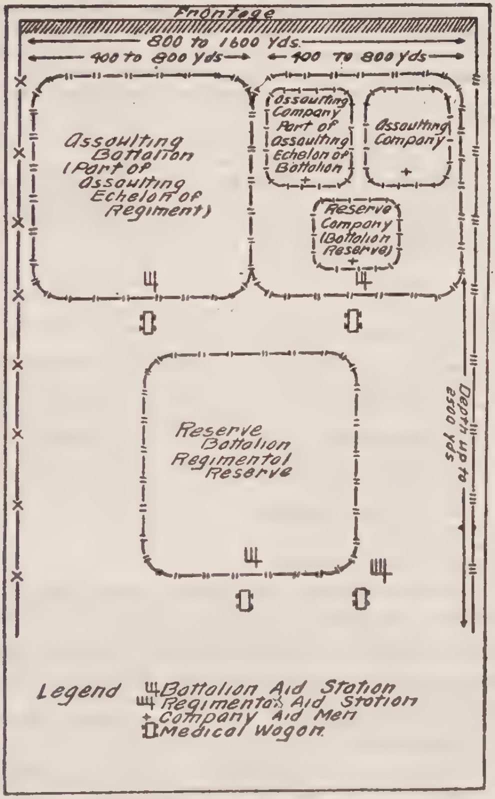
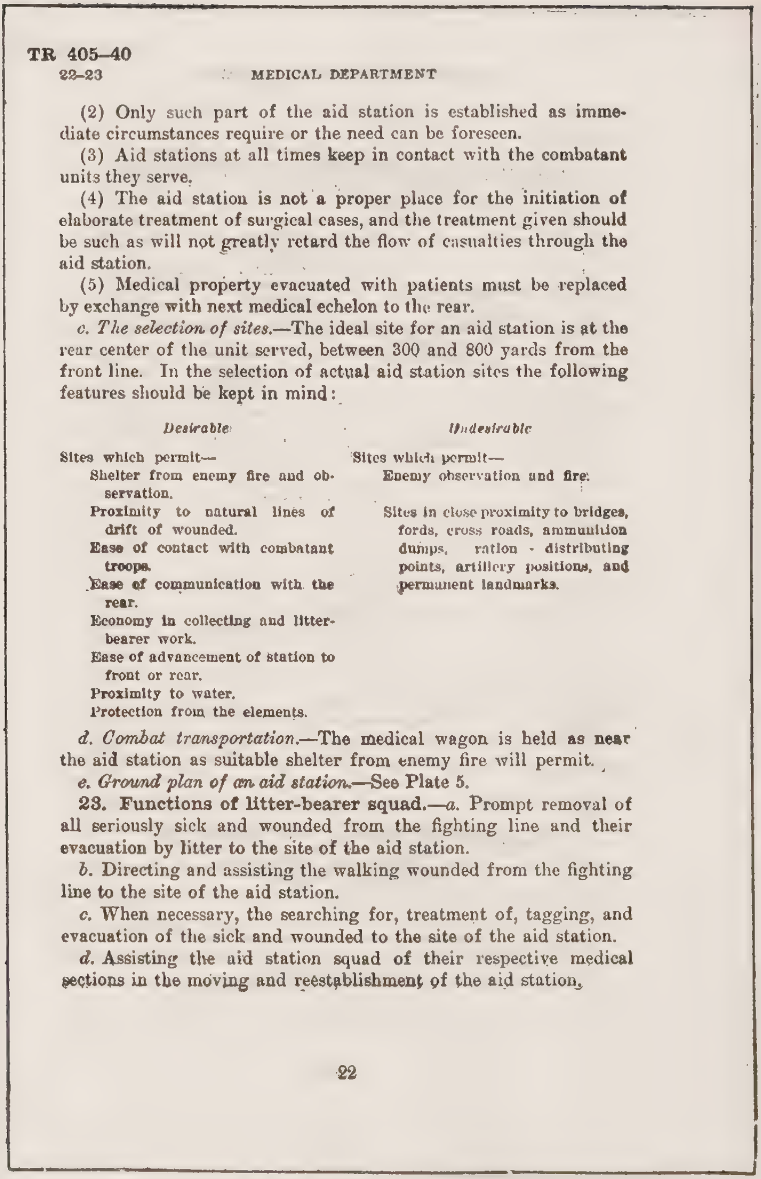

Frontage
800 to 1600 Yds.
400 to 800 yds
400 to 800 yds
Assaulting Battalion (Part of Assaulting Echelon of Regiment)
Assaulting Company Part of Assaulting Echelon of Battalion
Assaulting Company
Reserve Company (Battalion Reserve)
Reserve Battalion Regimental Reserve
Depth up to 2500 yds
Legend
Battalion Aid Station
Regimental Aid Station
Company Aid Men
Medical Wagon

PLATE 4.—Deployment of an infantry regiment, showing frontages, depths, and positions of medical detachment



(2) Only such part of the aid station is established as immediate circumstances require or the need can be foreseen.

(3) Aid stations at all times keep in contact with the combatant units they serve.

(4) The aid station is not a proper place for the initiation of elaborate treatment of surgical cases, and the treatment given should be such as will not greatly retard the flow of casualties through the aid station.

(5) Medical property evacuated with patients must be replaced by exchange with next medical echelon to the rear.

c. The selection of sites.—The ideal site for an aid station is at the rear center of the unit served, between 300 and 800 yards from the front line. In the selection of actual aid station sites the following features should be kept in mind:

Desirable	*Undesirable*
Sites which permit—	Sites which permit—
Shelter from enemy fire and observation.	Enemy observation and fire.
Proximity to natural lines of drift of wounded.	Sites in close proximity to bridges, fords, cross roads, ammunition dumps, ration - distributing points, artillery positions, and permanent landmarks.
Ease of contact with combatant troops.	
Ease of communication with the rear.	
Economy in collecting and litter-bearer work.	
Ease of advancement of station to front or rear.	
Proximity to water.	
Protection from the elements.	

d. Combat transportation.—The medical wagon is held as near the aid station as suitable shelter from enemy fire will permit.

e. Ground plan of an aid station.—See Plate 5.

23. Functions of litter-bearer squad.—*a.* Prompt removal of all seriously sick and wounded from the fighting line and their evacuation by litter to the site of the aid station.

b. Directing and assisting the walking wounded from the fighting line to the site of the aid station.

c. When necessary, the searching for, treatment of, tagging, and evacuation of the sick and wounded to the site of the aid station.

d. Assisting the aid station squad of their respective medical sections in the moving and reestablishment of the aid station.

24. Functions of company aid men.—Company aid men follow their respective companies in battle, giving such first-aid treatment as is possible, tagging sick, wounded, and dead, direct walking wounded to the position of the aid station, and place the casualties unable to walk in advantageous positions where they can be sheltered and picked up by litter squads. Use of the medical emergency tag is described in AR 40-1055. Company aid men also forward to battalion surgeons information in messages carried by litter bearers.

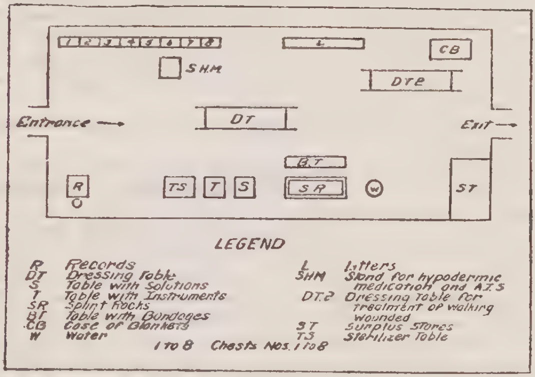


PLATE 5.—Aid station

25. Contact.—Contact is made as follows: Between regimental and battalion surgeons, by personal contact, or by runner of the headquarters medical detachment; between battalion surgeon and battalion commander, by personal contact or by runner of medical section; between aid station and combatant companies, by litter bearers and by messages from company aid men; between aid stations and collecting companies of medical regiment, ordinarily by runner from the collecting company. While the collecting company has the general responsibility of making and maintaining contact with the aid stations, the battalion surgeon or his assistant makes certain that the chain of evacuation will function, sending back an officer or noncommissioned officer to make the contact if necessary.

26. Veterinary aid station.—The functions and principles of establishment and operation of veterinary aid stations follow closely those of the medical service. (For details, see TR 405–2040.)

a. Functions.

(1) Reception and recording of casualties.

(2) Examination, sorting, application of dressings.

(3). The return to the organization of such cases able to do further duty; the destruction of incurably wounded. Animals to be evacuated are collected by personnel from the veterinary company of the medical regiment, who come forward to the aid station.

b. Principles for establishment and operation of aid stations.

(1) Aid stations are established in combat when required to relieve units of sick and wounded animals.

(2) Aid stations at all times keep in contact with the combatant unit they serve.

(3) The aid station is the proper place for the giving of first aid and emergency treatment; it is not the proper place for undertaking definitive treatment of any kind.

(4) Each animal evacuated should be equipped with halter and shank, complete, and blanket when such is being used.

c. The selection of sites.—The ideal site for the veterinary aid station is at or near the point where the majority of the animals of the regiment are assembled. In selecting actual sites for veterinary aid stations the same desirable or undesirable features should be kept in mind as in the case of aid stations for men. (See TR 405–2040.)

SECTION V

EMPLOYMENT IN PARTICULAR FORMS OF COMBAT

	Paragraph
In the attack	27
In the defense	28
In retrograde movements	29

27. In the attack.—*a.* In attack situations conditions will usually permit of the making of complete plans for medical detachment participation. The regimental commander's plan of action should be carefully studied, coordination secured with the combatant units, and detailed plans covering all phases of the medical detachment's participation in the action should be carefully formulated.

b. The headquarters medical detachment and regimental aid station should be held in a position of readiness near regimental headquarters. In certain situations it should retain its full mobility and be prepared to supply and reinforce the separate medical sections serving the battalions of the regiment. Aid-station matériel should be made readily available for the care of such casualties as may occur in the vicinity of regimental headquarters. In certain other situations the regimental aid station is established early in order that care and treatment may be given the wounded during the initial stages of the advance and before the establishment of battalion aid stations.

c. The surgeon, when necessary, procures authority for the use of the personnel of the band during the attack, and sees that it is properly organized, divided into litter squads, provided with litters, and thoroughly instructed in its duties. One or more squads may be attached to each medical section, or the surgeon may hold the entire personnel of the band as a reserve in the vicinity of medical detachment headquarters, sending squads forward to act as litter bearers only as actually needed.

d. Medical sections follow their respective battalions into position. Aid stations are fully or partially established in the most advantageous positions to serve their respective battalions. Such positions may be on, to the front of, or slightly to the rear of the line of departure of the combatant units. If a strong and well-maintained resistance is expected aid stations should be located on or slightly to the rear of the line of departure. If only moderate resistance is expected aid stations may under certain favorable conditions be located slightly to the front of the line of departure, thus greatly diminishing the work of the litter bearers during the early stages of the action and making movement and reestablishment of the aid station unnecessary until such time as the combatant units have advanced a considerable distance into enemy territory.

e. Company aid men (2 to each combatant company) follow into action companies to which assigned. Companies usually attack with 2 platoons in the assault echelon and 1 platoon in support. Company aid men attached to companies take position to the immediate rear and center of each platoon in the assault echelon, and in so far as is practicable maintain this position throughout the attack. They carry only such equipment as is authorized for the Medical Department soldier plus a few additional dressings, and when obviously necessary an extra canteen of water. This personnel is not provided with litters. The duties of company aid men during the attack are as follows:

(1) Maintenance of contact with the companies to which assigned.

(2) The forwarding of information to their respective battalion surgeons (by litter bearers). This information will include progress made by their companies in the attack, their exact location on the terrain, and the approximate number of casualties occurring in each company.

(3) Administration of first aid and the tagging of sick and wounded.

(4) Examination and tagging of the dead and the marking of the position where they lie (dead soldier's rifle stuck in the ground and cap or helmet hung from upper end).

(5) Instructing the sick and walking wounded concerning the exact site of the aid station and the proper route to be used in proceeding thereto.

(6) The placing of all seriously sick and wounded on the central axis of advance of the company which they serve.

f. The position of the seriously wounded left on the axis of advance may or may not be marked, depending on standing orders and the ability or inability of the enemy to obtain observation of such procedure. Wounded requiring movement to the axis of advance or to protected positions on the terrain will be moved to such positions when time permits. Company aid men assigned to the machine-gun company of the battalion may be widely separated and unable to combine their forces in the care and removal of the wounded. For this reason they should be given more detailed instruction and taught to work independently. In general each functions in the same manner as do company aid men attached to the rifle companies of the battalion.

g. As soon as the action commences the litter-bearer squad of the medical section moves forward from its position in the vicinity of the aid station with instructions to make contact with company aid men and to clear the battalion area of all wounded. This squad operates along the axis of advance of each company in the assault echelon of the battalion, evacuating the wounded from such lines to the aid station. In proceeding from and to front-line positions the litter bearers of the squad cover all ground lying between the axis of advance of each company in the assault echelon, searching for additional wounded and evacuating such as are found to the aid station. Where all distances are short this squad may use 4 litters (2 bearers to each litter), but later in the attack, when the distances are greater, ordinarily they use 2 litters (4 bearers to each litter). The field litter carrier greatly lightens the litter work of the squad in all situations where it can be advantageously used.

h. All aid station blotters are checked at frequent intervals, casualties totaled, and the battalion commander and the regimental surgeon informed of the total losses which the battalion has sustained during the period.

i. As the attack progresses the separate medical sections move forward in order to maintain contact with the battalions they serve and reduce the distance of litter carry. During rapid movement wounded, after having been given first aid, may be left on the ground to be found, cared for, and evacuated by the medical regiment. When the regiment obtains its principal objective combat activity diminishes, and the troops proceed to the consolidation of their new positions pending orders to resume the attack or take up the defensive in the positions thus obtained. During this period the medical detachment clears the regimental area and all aid stations of wounded, feeds its personnel, obtains additional medical supplies, and forwards to headquarters requisitions for replacements. Further activity of the medical detachment depends upon the continuance of the attack or a change in the type of action. If the attack is continued the employment of the medical detachment conforms to the foregoing. If the combatant troops take up defensive action in their new positions the medical detachment is employed as in the defense. If the combatant troops withdraw from the newly obtained positions the medical detachment is employed as outlined in paragraph 29.

j. The chart following illustrates the disposition of the medical section serving an Infantry battalion during an attack.

ONE BATTALION OF INFANTRY IN ATTACK

Infantry formations		*Medical Section formations*
Pursuit	8th phase	Company aid men with companies to which attached. Litter-bearer squad following the axis of advance of the battalion. Aid station squad moving forward in close contact with the rear elements of the battalion.
Reorganization of companies.	7th phase	Company aid men as in 6th phase. Litter-bearer squad as in 6th phase. Aid station squad may be moving forward to obtain closer contact.
Organization of positions.	6th phase	Company aid men join companies to which attached. Aid station squad getting ready to move forward. Litter-bearer squad clear ground up to this phase.
Assault	5th phase	Company aid men temporarily held up on the forward line of the 4th phase. Aid station established in 3rd or 4th phase. Litter-bearer squad as in 4th phase.
Zone of advance in attack formation. Heavy fire of all kinds.	4th phase	Company aid men following the assault companies to which attached. Aid station squad as in the 3rd phase or establishing station. Litter-bearer squad as in 3rd phase.
Zone of advance by squad column. Heavier shelling and indirect machine gunfire.	3rd phase	Company aid men closely following the assault companies to which attached. Battalion surgeon makes local reconnaissance for aid station site. Aid station squad held in position of readiness. Litter-bearer squad following the axis of advance of the assault companies.
Zone of advance by section column. Casual shelling.	2nd phase	Company aid men as in the 1st phase. Medical sections less the company aid squad following the battalion reserve. Aid station material being transported by wagon or by hand.
Zone of battalion advance in column of squads.	1st phase	Company aid men with companies to which attached. Aid station squad, litter-bearer squad, and medical wagon following in rear of battalion.

28. In the defense.—*a.* Defensive situations usually afford time and opportunity for a thorough organization of the medical service within the area occupied by the regiment. In this type of action certain special features enter into the administration of the medical service, these becoming particularly important in a prolonged defense of a given zone and of less importance as the defense becomes more temporary in character. There usually is sufficient time for a systematic reconnaissance of the entire area occupied by the regiment and for the preparation of medical plans of operation therein. All dispositions should be made in such a manner as to give efficient medical service and at the same time permit of relief, rest, and further training of medical personnel. The positions occupied are progressively improved from date of occupancy. When necessary, shelter is constructed for all aid stations and overhead cover provided as a protection to stations and personnel.

b. The regimental aid station is partially established in the vicinity of regimental headquarters, the extent of this establishment being determined by the duration of this type of action, the distance of this position from the front, and whether or not this station is to constitute a link in the chain of evacuation of casualties from the regiment.

c. Aid stations of the battalions are fully established in the best obtainable positions, the distance of such positions from the front being dependent upon the disposition of the combatant troops, the particular features of the terrain, and the normal lines of drift for the wounded.

d. The litter-bearer squad of each medical section makes and maintains contact with company aid men in their respective positions with combatant companies, and continues to evacuate by litter all sick and wounded unable to walk to the aid station.

e. Company aid men remain with the combatant companies to which assigned, and when the duration of this type of action allows they organize small company aid posts within each company area. Such aid posts may contain little other than a few additional dressings, but constitute points where the company sick and injured may be given first-aid treatment through the combined efforts of the company aid men. During the entire period of this type of action one company aid man from each combatant company should be required to report in person at the aid station maintained by his medical section at least once daily for the purpose of giving information and obtaining further instructions.

f. Battalion surgeons should maintain close contact with the battalion command posts. Large patrols may be sent out and raids at night may be made into the enemy's line for the purpose of obtaining prisoners and information. Battalion surgeons should have full information concerning such activities to enable them to cooperate in the best possible manner to provide care and evacuation for the resulting casualties. A defense always terminates in some other type of action, therefore medical officers must keep themselves thoroughly informed concerning the general military situation and the plans of their respective commanders.

29. In retrograde movements.—*a.* A retrograde movement is a planned withdrawal on the part of a deployed force engaged with the enemy. Its purpose is to improve the tactical disposition of the command, to refuse or to break off a decisive engagement, or to begin a retreat or retirement. In carrying out a withdrawal the troops in contact with the enemy are gradually withdrawn and pursuit is held in check by delaying action on the part of a covering force occupying selected covering positions. The principal steps in a withdrawal are—

(1) The selection of a position or of successive positions from which to cover the withdrawal of troops and delay hostile pursuit.

(2) The formation of a covering force and its occupancy of initial covering positions.

(3) The designation of a position well to the rear to which units will be withdrawn, assembled, and reorganized.

(4) The withdrawal of troops in contact with the enemy.

(5) Delaying the hostile advance.

(6) The organization of the rear guard and the formation of the main body of troops in columns of march as they arrive at the designated point of assembly when withdrawal is made for the purpose of carrying out retreat.

b. The full employment of the medical detachment during a withdrawal from combat is influenced by the manner in which the withdrawal is accomplished, the strength of the covering force, the location of the covering positions to be occupied, the location of the assembly area in the rear, rapidity of troop movement, and the effectiveness of the delaying action.

c. Units of the medical detachment maintain contact and continue to render medical service to the organizations which they serve. Medical detachment headquarters remain in close contact and continue to serve regimental headquarters troops. Medical sections remain in contact and continue to serve the separate battalions to which attached.

d. If already established at the beginning of a withdrawal, the regimental aid station may become a very important link in the chain of evacuation of casualties. If not established all aid station equipment should be packed and the medical detachment headquarters unit should be prepared to move to a new position without delay. During any phase of the withdrawal the headquarters medical detachment may be called upon to augment the work of the medical sections or to establish a station at some point in the rear through which it may become necessary to evacuate all casualties from the regiment.

e. If the covering position is occupied by a battalion it is accompanied by its respective medical section. The aid station is partially established well to the rear of the position, providing the delaying action is strong and the hostile pursuit is slow and weak. If the hostile pursuit is strong and rapid and the delaying action is weak the medical section serving the battalion will be able to accomplish little more than the first-aid treatment of casualties and their removal to a designated collecting point, preferably near a roadway over which troops pass in proceeding to the rear. The medical section transportation is held conveniently near or at the site of the aid station, and every effort is made to keep the medical section mobile.

f. When the covering positions are occupied by 1 or 2 companies such companies are followed into position by the company aid men originally attached, who combine their efforts, establish normal collecting points for the sick and injured, and care for the casualties in the same manner as prescribed for troops in a defensive action. When the medical section is thus divided the battalion surgeon will usually order his assistant to direct and supervise the work of isolated groups of medical personnel.

g. In a withdrawal the movement of medical sections or squads thereof serving combatant organizations in contact with the enemy conform to the movement of such organizations. If the movement is rapid no attempt is made to establish aid stations, but selected collecting points should be designated along the battalion's axis of withdrawal. The aid station squads of medical sections occupy such points and provide emergency treatment for the largest possible number of casualties. As organizations in contact with the enemy approach these points in their withdrawal the position is vacated and the aid station squad proceeds to the next designated collecting point in the rear, taking with them as many seriously wounded as possible.

h. Every effort is made to prevent large numbers of wounded from falling into the hands of the enemy. When this can not be avoided the surgeon considers the necessity of leaving a minimum number of medical personnel, together with medical supplies, on the field in order that the wounded may receive early medical attention as prisoners in the hands of the enemy.

i. Troops not in contact with the enemy or occupying selected covering positions proceed to the designated assembly point accompanied by their attached medical personnel. The disposition of such medical personnel conforms to that prescribed for normal march formations.

j. In all retrograde movements it is highly important that the collecting company charged with the evacuation of the sick and wounded from the regimental area maintain close contact with aid stations and collecting points established by medical detachments and sections.

k. Following the withdrawal the regiment may occupy a new defensive position, or the withdrawal may simply initiate a retreat. If the troops occupy a defensive position the medical detachment is employed as in defense. If withdrawal initiates a retreat the employment of the medical detachment conforms to the principles as set forth in this paragraph and in paragraph 16.

SECTION VI

EMPLOYMENT WITH UNITS OTHER THAN INFANTRY

Paragraph
With Artillery ---------- 30
With Cavalry ---------- 31
With other units ---------- 32

30. With Artillery.—*a.* The basic principles as set forth in the preceding paragraphs for the tactical management of medical detachments attached to regiments of Infantry are, in so far as practicable, applied in the general management and control of medical detachments attached to regiments of Field Artillery.

b. For tactical employment in the field the medical detachment serving a regiment of Field Artillery is divided into a medical detachment headquarters and 2 or 3 medical sections. (See par. 12.)

c. With troops in garrison, on the march, or in permanent or semipermanent camps, the service rendered by medical detachments attached to regiments of Artillery is practically the same as in the case of medical detachments attached to regiments of Infantry.

d. In combat the headquarters medical detachment and regimental aid station are established at or near the rear echelon of the regiment. From this position the surgeon maintains contact with regimental headquarters and with each medical section, supervising, reinforcing, and to a limited degree supplying these latter units with medical supplies and material. The regimental aid station is established by the personnel of the headquarters medical detachment, and may or may not constitute a link in the chain of evacuation of casualties from the regiment.

e. Medical sections follow their respective battalions into position, establish aid stations, and make contact with their respective battery aid squads. Aid station sites should in general conform to the requirements as set forth in paragraph 22. Aid stations should never be established near ammunition dumps, or in close proximity to the designated parking places for artillery caissons and combat trains. They may be established near roadways, but always between important points such as road intersections and crossroads. A road leading to or from the immediate vicinity of the aid station is highly desirable, since this insures evacuation by ambulance. With the exception as noted below, aid stations of Artillery units function in the same general way as do aid stations serving Infantry units.

(1) Medical sections attached to battalions of Artillery do not have regularly constituted litter-bearer squads within their organization. All sick and wounded unable to walk must be evacuated from battery positions by the aid station and battery aid squads. When unusual activity develops, and when the litter carry from battery positions to the aid station is long, the medical section should be reinforced by personnel from the band. In certain favorable situations the sick and wounded may be evacuated directly from battery positions to waiting ambulances.

(2) Aid stations usually are evacuated by ambulances attached to the regiment or belonging to organized ambulance companies charged with the evacuation of the area.

(3) The battle day casualty rate for a regiment of Artillery is usually very low as compared with the battle day casualty rate for a regiment of Infantry. Therefore more time and attention can be given to the sick and wounded at all aid stations.

f. The sick and wounded in all battery positions are first seen, given emergency treatment, and cared for by battery aid men (2 in number) attached to each battery. Battery aid men eat and sleep with the batteries to which attached during period of activity, and only return to their respective medical sections at such times as the regiment is brought together for rest or training. Battery aid men are trained and instructed in the same manner as are company aid men attached to companies of Infantry. When a battery remains in one position for a considerable period of time battery aid men obtain a small surplus of medical supplies with which to establish local aid posts within their respective battery positions. Each battery aid man is instructed to care for the casualties occurring in his own platoon, and for the accomplishment of this work takes position in or close to the gun emplacement of his respective platoon when the guns are being fired or when the position is being fired upon by the enemy. Casualties occurring in gun pits are immediately removed to a place of greater safety, given first aid, tagged, and carried or directed to the position of the aid station. In all stabilized or partially stabilized situations battery aid men are required to report at least once daily at the aid station for the purpose of giving information and receiving instructions.

g. When roving guns are employed they should always be accompanied by battery aid men, who will care for the casualties in the same manner as in the case of casualties occurring in the platoon or battery. Casualties occurring in accompanying batteries or gun sections are treated at and evacuated through the aid stations established by the medical detachment serving in the Infantry organization.

31. With Cavalry.—*a.* The basic principles as set forth in Section V and in paragraph 30 will, in so far as practicable, be applied in the general management and control of regimental medical detachments attached to regiments of Cavalry

b. For tactical employment in the field the medical detachment serving a regiment of Cavalry is divided into a medical detachment headquarters and 2 medical sections. (See par. 13.)

c. With troops in garrison, on the march, or in permanent or semipermanent camps the service rendered by medical detachments attached to regiments of cavalry is practically the same as in the case of medical detachments attached to regiments of Infantry.

d. In combat the headquarters medical detachment usually accompanies the regimental reserve, from which position it will supervise, reinforce, and to a limited degree supply the medical sections serving the squadrons of the regiment. The medical wagon remains with the regimental combat train until such time as it is ordered forward for the purpose of establishing a regimental aid station. The regimental surgeon should maintain close contact with the regimental commander and with each medical section of the detachment. When the regiment is in hostile territory or in contact with an enemy force the surgeon should procure authority for the use of the band, see that it is properly equipped and instructed, and held in a position of readiness to assist the medical detachment in the collection and care of the sick and wounded.

e. Medical sections closely follow the squadrons to which attached. The squadron surgeon maintains close contact with each troop of the squadron. When the squadron deploys for action the squadron surgeon, medical section, and such band personnel as may be attached take up a position with or near the squadron reserve. With Cavalry organizations in combat, aid stations can not often be established with any degree of assurance that they will long continue to function for the relief of the units which they are designed to serve. In certain special situations aid stations may be definitely established, but in any other situations fully established aid stations do not function properly and only tend to decrease the mobility of the medical unit and increase the difficulty in maintenance of contact with the troops which they serve. The decision as to whether aid stations should or should not be established to cover any given situation must rest with the regimental and squadron surgeons, who are influenced in making such decisions by the relative dispersion of troops, their principal mission, the character of the action anticipated, and the character of the terrain over which the troops will operate. In general the following principles will govern in the establishment or nonestablishment of aid stations:

(1) Aid stations should never be fully established during periods of continued and rapid movement of troops.

(2) As a rule aid stations should not be established when the dispersion of troops is such that any given aid station will not serve more than one troop.

(3) When Cavalry is employed as a covering force, acting as a screen for the advance of troops, conducting distant reconnaissance, or employed in connecting separate armies or parts of armies in their advance, no attempts should be made to establish aid stations except at halts for the night and at such other times as minor contacts with the enemy may produce a grouping of casualties and a temporary cessation of movement.

(4) During actual combat, when the Cavalry regiment or squadrons thereof are operating on the enemy's flank, exploiting a break in the enemy's line, filling gaps in the line, or participating in the main battle, aid stations should be partially or fully established. When Cavalry is employed as a covering force aid stations may be partially established, but a high degree of mobility should be maintained.

(5) The regimental aid station may be established in any of the foregoing situations when it is to become a link in the chain of evacuation of casualties or is in any other way actually necessary for the conduct of the medical service of the regiment. At such times as the regimental aid station is inactive the personnel thereof is used as a reserve and supporting unit for the separate medical sections of the detachment.

f. Two aid men of the troop aid squad of the medical section are attached to each troop while the squadron is on the march, operating in hostile territory, or is in actual contact with the enemy. Troop aid men function with each troop of Cavalry in the same manner as do company and battery aid men attached to companies of infantry and batteries of Field Artillery. Casualties occurring in the troop are first attended by troop aid men, by whom they are examined, dressed, tagged, and directed to the position of the aid station squad of the medical section attached to the squadron. Casualties unable to walk are removed to the position of the aid station squad by the use of their own mounts, the travois, or by requisitioned wheeled transportation. Casualties unable to endure transportation are left with medical material and with or without medical attendants in the care of civil inhabitants. Casualties received at the station are examined, recorded, given such initial treatment as their condition demands, and are then disposed of in some one of the following ways:

(1) Directed to rejoin their organizations.

(2) Allowed to remain with the medical section, where they receive further treatment, and take advantage of such transportation as is available.

(3) Evacuated to the position of the headquarters medical detachment when that unit constitutes a link in the chain of evacuation to the rear or is for any reason temporarily inactive and able to shelter, feed, and give further treatment to the sick and wounded.

(4) Evacuated by the medical squadron.

(5) Directed to make contact with or evacuated to the position of near-by friendly units, especially Infantry organizations.

(6) Evacuated to a designated place of hospitalization through the agency of attached ambulances, requisitioned wheeled transportation, the field litter carrier, travois, or by the use of their own mounts.

g. In many situations, such as delaying actions, the holding of strategic points, or when Cavalry units go to the assistance of hard-pressed Infantry, Cavalry may be temporarily dismounted to fight on foot. This is known as dismounted action of Cavalry, and throughout its duration the medical service of the organization is conducted in the same general manner as for like organizations of Infantry. Troop aid men should accompany their troops into action. Medical sections may or may not establish aid stations, depending upon the type, probable duration, and probable extent of the action. If aid stations are not established collecting points for the sick and wounded are designated along the axis of movement of each troop or upon the previously designated line of withdrawal of such units.

h. When a single troop of Cavalry for any reason is detached from its parent organization the troop aid men normally attached remain with it for the purpose of conducting the medical service of the troop. If the troop is to be detached for more than a few days, and is accompanied by a medical officer, a medical and surgical chest or box of medicines and dressings should be carried on one of the wagons accompanying the troop.

i. The medical detachment serving a regiment of Cavalry makes and maintains contact with the same organized units and in the same general manner as do medical detachments serving regiments of Infantry.

32. With other units.—The basic principles of interior organization, general and tactical management of medical detachments in garrison, on the march, in camp, and in combat as laid down in this Training Regulation are, in so far as is practicable, followed in the interior organization, general and tactical management of all medical detachments attached to division trains, the division air service, combat Engineer regiments, ammunition trains of Artillery brigades, and special troops of the Infantry division.

[A. G. 062.12 (8–7–25).]

BY ORDER OF THE SECRETARY OF WAR:

J. L. HINES,
Major General,
Chief of Staff.

OFFICIAL:
ROBERT C. DAVIS,
Major General,
The Adjutant General.

CHAPTER XI

ANATOMY AND PHYSIOLOGY

Introduction. In order that the medical soldier may intelligently perform his numerous duties in connection with the sick and wounded, it is necessary that he should understand something of the structure of the human body and the functions of its various organs. It is not intended to give him that little incomplete knowledge that is a "dangerous thing," but rather a knowledge which, while not like that of a physician, is complete so far as it goes.

Anatomy is the study of the structure of the body and the relation of the different tissues and organs of the body to one another.

Physiology is the science which treats of the function of living bodies, and teaches the use and activity of the various organs in life.

Skeleton and Joints. The skeleton is the bony framework of the body, gives it stability and form, and protects the organs, while the joints permit of motion.

Bone is composed of about one-third animal matter, mostly gelatin, and two-thirds mineral matter, chiefly lime salts. The animal matter gives bone its toughness and elasticity; this may be demonstrated by leaving a bone for some time in dilute acid by which the mineral matter is removed and the gelatin alone is left; the bone may then be tied in a knot. The mineral matter gives the bone its hardness; the animal matter is all removed by burning the bone which then becomes brittle as chalk. Young bones contain more animal matter and are hence tougher and harder to break; when they do break, the fracture is apt to be incomplete like a broken green stick. Elderly persons' bones break easily because they contain more mineral matter.

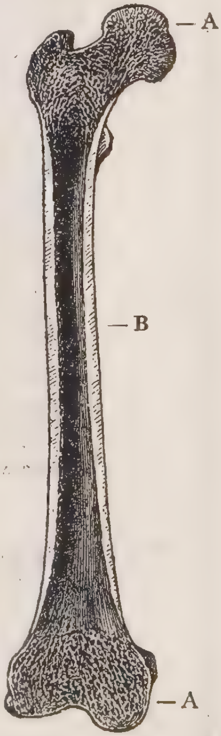


Fig. 27.—Section of Femur. *A, A,* Cancellous tissue; *B,* compact tissues.

If you saw a long bone across, the end will be found spongy or *cancellous,* while the shaft is *compact* and dense. The shaft is also hollow and contains *marrow* (Fig. 27).

Bone is covered by a vascular membrane, the *periosteum,* which nourishes the bone; where the periosteum is stripped off, the bone is apt to die from insufficient nourishment, the death of the bone being known as *caries* or *necrosis.*

The bones of the human body number about two hundred, without counting the thirty-two teeth and some accessory small bones; taken together with the cartilages they compose the skeleton. *Cartilage,* or *gristle,* is an elastic substance, like bone without mineral matter; it is seen extending from the lower ribs to the breast bone and covering the ends of the long bones.

The bones are classified as *long, short, flat,* and *irregular.*

The *long bones,* of which the thigh bone is an example, form a system of levers which support the weight of the body and provide the means of locomotion. The *short bones,* such as those of the wrist, are found where strength and limited motion are the requisites; the *flat bones,* of which the bones of the skull are an example, serve principally for protection; the *irregular bones* are illustrated by those of the pelvis.

In considering the skeleton (Fig. 28) let us start from the *vertebral column,* also called the *spinal column, spine,* or *backbone.* The name *vertebra* is given to each separate bone composing the column. The

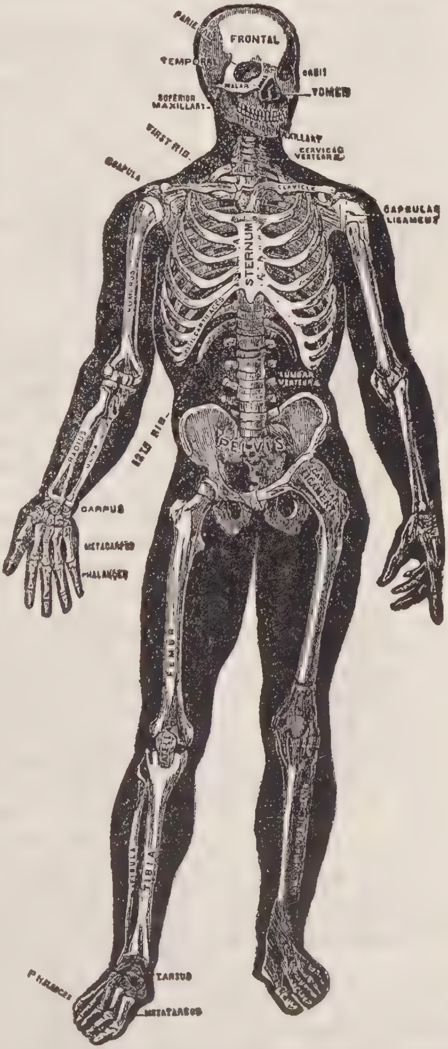


Fig. 28.—Skeleton. (Jaw-bones formerly known as superior maxillary and inferior maxillary are now called maxilla and mandible, respectively).

separate bones are not allowed to rub against each other, but are separated by pads or buffers of elastic cartilage, and at the same time held together by strong fibrous *ligaments.*

These buffers of *intervertebral substance* break up and distribute the shock which would otherwise result from falls or in jumping.

On looking at the spine (Fig 29) it will be observed that it increases in size from above downward, which is but natural when one considers the increase in weight to be borne by the lower part as compared with the upper. The highest vertebræ, those of the neck, seven in number, and called *cervical,* support the head only. Next in order come the twelve *thoracic,* which in addition support the ribs, chest, and upper extremities. In the next region, the *small of the back,* are found the five massive *lumbar* vertebræ, which have the entire trunk to support. The vertebral column ends in two large masses of bone known as the *sacrum,* and the *coccyx,* or tailpiece. In growing youth the sacrum is composed of five separate bones and the coccyx of four, but in the adult these separate bones are welded into one mass.

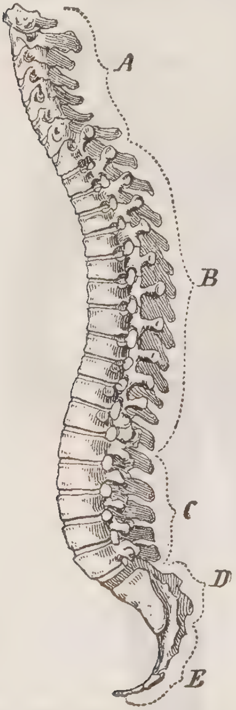


Fig. 29—Spinal Column. *A,* Cervical; *B,* thoracic; *C,* lumbar; *D,* sacrum; *E,* coccyx.

Each vertebra consists of a solid *body* in front and an *arch* enclosing a central cavity behind. When the vertebræ are in their natural position, one resting upon another, the arches together form a canal, the *spinal canal,* which in the living body contains and protects the *spinal cord.*

The spinal cord is contained in the small vertebral canal and is very liable to injury. When a fracture or dislocation of the spinal column is sustained a laceration of the cord is almost certain to occur, and it is this coincident damage to the cord which gives to these injuries their special importance.

If the fingers are drawn along the center of one's back they come in contact with a number of projecting bony points; these are the *spinous processes* of each vertebra and are situated on the back of the arch.

Both the sacrum and coccyx take part in the formation of the large girdle of bone met with at the lower part of the trunk under the name of the *pelvis,* or basin (Fig. 30), and which receives the weight of the body and hands it over to the lower extremities at the hip joints. The sacrum forms the keystone of the arch, the sides of which are composed of the two *innominate bones* or *nameless bones,* separated in front by a pad of cartilage, and all locked together by powerful ligaments.

Within the pelvis are situated the urinary bladder in front and the rectum behind, and, in the female between the two is placed the uterus. Each innominate bone consisted originally of three bones, the *ilium, ischium,* and *pubis,* but these become fused together so as to form one bone in the adult. On each side of the pelvis is seen a cup-shaped cavity in the innominate bone, known as the *acetabulum,* the purpose of which is to receive the spherical head of the *femur,* so as to make the hip joint.

Joints. A joint is the place where two bones meet and move upon each other; the ends of the bones are covered with smooth cartilage and to still further prevent friction the cartilages and the whole joint are enclosed in a smooth, glistening membrane, the *synovial membrane,* which secrets the *synovia* or joint oil.

Outside the synovial membrane the bones are firmly bound together by fibrous *ligaments,* while the joint is still further strengthened by the surrounding muscles. A joint, therefore, consists of bones, cartilages, synovial membrane, and ligaments.

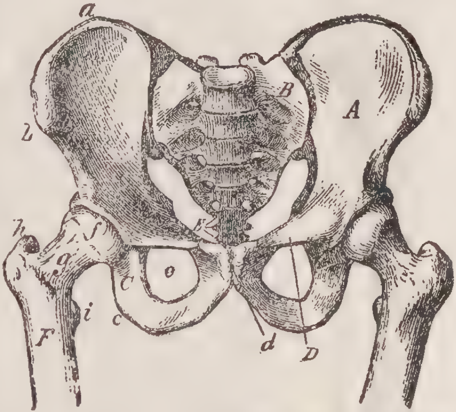


Fig. 30—Pelvis. *A,* Innominate bone; *B,* sacrum; *E,* coccyx.

Joints differ very much in their character and the kind of motion they permit. Thus we have the almost perfect freedom of motion permitted by the *ball-and-socket joints,* like the shoulder and hip, the more limited motion of *hinged joints,* like the knee, and the almost motionless, imperfect joints, such as the *sutures* of the skull.

A *dislocation* is a slipping away of the joint surfaces from each other to such an extent that they remain "out of place" and the joint is locked; in such a deep, strong joint as the hip, violence is more apt to give rise to fracture than to dislocation.

Entering into the formation of the hip joint is the *thigh bone* or *femur* (Fig. 31), the largest and longest bone in the body. Like other long bones it has a *shaft* and *two extremities.* The upper extremity consists of a *head, neck,* and two *trochanters.* The head is globular and attached to the shaft by a narrow neck set at an angle; it is in this narrow neck that fracture so frequently occurs.

The trochanters are merely bony knobs to which muscles are attached to move the joints; the *great trochanter* is the part or prominence which you may feel just under the skin on the outer side of the thigh. The lower extremity of the femur is expanded into two broad *condyles,* which with the upper end of the *tibia* or *shin-bone,* and the *patella* or *knee-cap,* (Fig. 32) form the *knee-joint.* The patella is the small round bone lying just in front of the knee, and in the extended position of the leg is freely movable with the tendon in which it lies.

The knee joint is the largest in the body and from its exposed position one of those most liable to injury; once injured it is apt to be sensitive ever afterward.

Fig. 31.—Femur.

Beyond the knee we come to the leg, composed of the *tibia* on the inside and the *fibula* or *splint bone* on the outside (Fig. 33). The tibia is a strong prism-shaped bone, the inner surface and front edge just beneath the skin constituting the *shin;* on account of its being just beneath the skin, fractures of the bone are apt to be *compound.* The fibula is a long slender bone deeply buried under the muscles; it is frequently broken just above the ankle, where it can be felt; such a break is known as a "Pott's fracture."

The ankle joint is made up of the tibia and fibula above, and the astragalus below; it is a strong joint, so much so that while it is frequently subjected to violent wrenches and strains, dislocation seldom occurs; under such conditions the joint surfaces do not slip entirely away from each other, but the ligaments and synovial membrane are torn, and blood is poured out into and about the joint, constituting the condition known as *sprain.*

Beyond the ankle is the *foot,* composed of the *tarsus, metatarsus,* and *phalanges.* The tarsus, besides the *astragalus,* already referred to as helping to form the ankle joint, contains the *os calcis* or heel bone, and five other small bones, making seven in all.

The metatarsus lies in that part of the foot just behind the toes, and is composed of five long bones. The *phalanges* or *toe bones* are so called because they are arranged in phalanx or rows; there are three for each toe, except the great toe which has only two.

Fig. 32.—Patella.

To go back to the vertebral column. Connected with its thoracic portion are twelve *ribs* on each side, and closing in the space between the ribs in front so as to form the *thorax,* is the *breast bone* or *sternum.*

It is scarcely necessary to say that the number of ribs is the same in man as in woman, though there is an old tradition that Adam lost one rib in order to gain a wife. The seven upper ribs are connected directly to the sternum in front by their cartilages and are known as *true ribs;* the five remaining are known as *false ribs,* and the last two which are not connected with those above are known as *floating ribs.* The *breast bone* or *sternum* is composed of three parts, and extends from the root of the neck to the pit of the stomach. The *thorax* or *chest* so formed is a bony cage which encloses and protects the heart and lungs; it is separated from the abdomen by a broad, muscular partition, arching upward, and known as the *diaphragm*.

Connected with the thorax is the upper extremity composed of the *shoulder* and *shoulder joint, arm, elbow joint, forearm, wrist joint,* and *hand.*

The shoulder is composed of the *clavicle* or *collar bone,* and the *scapula* or *shoulder blade.* The clavicle (Fig. 34) is a very strong bone with a double curve like the Italic letter *s.* It is connected at one end with the breast bone, and at the other with a process of the shoulder blade known as the *acromion;* it is the acromion process which we feel just under the skin at the point of the shoulder. The clavicle, notwithstanding its strength, is very frequently broken, owing to its fixed position and the fact that it receives the jars transmitted through the upper extremity when one tries to save himself in falling by throwing out the arm. The *scapula* (Fig. 35) is a freely movable flat bone connected at one end with the collar bone to form the arch of the shoulder; its outer angle or head contains a shallow, saucer-shaped depression known as the *glenoid cavity* for the reception of the head of the humerus to form the *shoulder joint.* The shoulder, like the hip, is a ball-and-socket joint, but unlike the hip, the socket is very shallow, so that the head of the humerus in the very free motion permitted easily rolls over the edge and becomes dislocated; as a matter of fact dislocation at the shoulder joint is many times more frequent than that of all the other joints of the body put together, so that in obscure injuries to the shoulder we always look for dislocation.

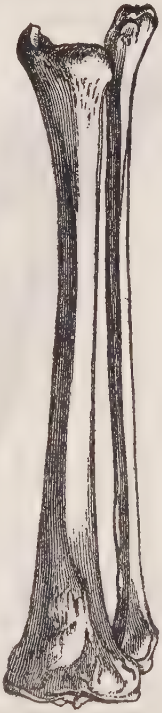


Fig. 33.—Tibia and Fibula.

The arm is that portion of the upper extremity which lies between the shoulder and elbow; like the thigh it contains but one bone, the *humerus* (Fig. 36). The upper end of the humerus consists of the *head* and the *tuberosities,* the *anatomical neck* lying between the two, and the *surgical*

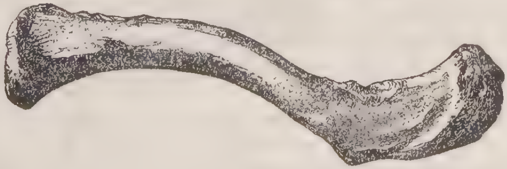


Fig. 34.— Clavicle.

neck, the constricted portion of the shaft just below the tuberosities; the surgical neck is so called because it is the part most frequently broken.

The lower end of the humerus is expanded to form the elbow joint and has a projection on each side known as a *condyle.*

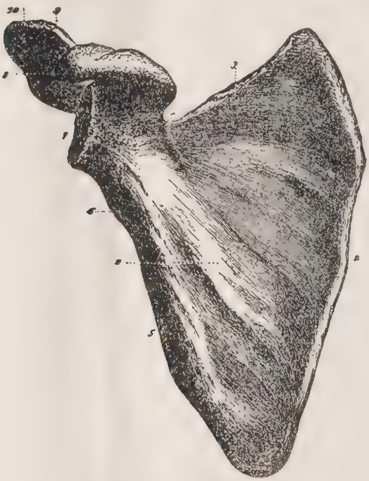


Fig. 35.— Scapula.

The elbow joint is made up of the humerus and the two bones of the forearm, the *radius* and *ulna* (Fig. 37).

The *radius* lies on the outer side of the arm and is so called because it radiates about its fellow in the motion of *pronation,* in which the palm of the hand is turned down, and *supination,* in which the palm is turned up. The radius has a small *head* which takes but little part in the elbow joint, but a large lower end which with the *carpus* forms the wrist joint to the entire exclusion of the *ulna.* It is because of the radius resisting almost alone the force of falls upon the hand that it is broken so much more often than the ulna. Such a break just above the wrist joint is very common and is known as a "Colles's fracture."

The *ulna* has its upper end most highly developed, forming a protection which extends back behind the elbow joint protecting it in the same manner as the patella does the knee joint. This protection forms the "point of the elbow" and is called the *olecranon.*

The *wrist* or *carpus* is composed of eight small bones in two rows of four each, the upper row together with the lower end of the radius forming the *wrist joint.* The hand is composed of the five *metacarpal* bones, while the fingers have three rows of *phalanges,* except the thumb which has two only.

Balanced on the top of the spinal column and forming a joint with its uppermost vertebra is the skull (Fig. 38). The *skull* is usually considered in two parts, the *cranium* which contains the *brain,* and the *face.* The cranium is that part which lies above a line drawn from the nape of the neck through the ears to

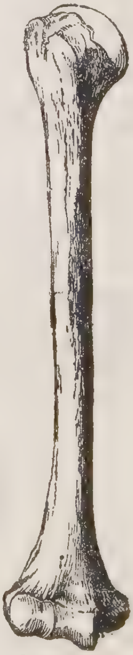


Fig. 36.— Humerus.

above the eyebrows, and the brain here lies everywhere in contact with the bone so that a fracture of the cranium like one of the spine, derives its special seriousness from the accompanying injury to the brain. In front, however, just over the eyes, the two plates of which the cranial bones are composed separate to leave a space known as the *frontal sinuses;* here fractures of the outer plate may occur without injury to the brain. The cranium varies in thickness from about that of paper at the temples to a quarter of an inch or more behind.

The visible portion of the cranium is composed of six bones, the *frontal* in front, the *occipital* behind, the *parietals* on top, and the two *temporals* on the sides. In the lower part of the occipital bone is a large round hole known as the *foramen magnum,* through which the spinal cord makes connection with the brain.

The face is composed of fourteen bones, arranged mostly in pairs, and forming the two *orbits,* the *nose,* and *mouth.* The only facial bones necessary to remember are the two, tiny, *nasal bones* which form the arch of the nose, and two *maxillae* and the *mandible* which contain the teeth and enclose the mouth.

The mandible is the only movable bone of the face; its joints with the upper jaw lie just in front of the ear where the head of the bone can be felt to move when the mouth is opened.

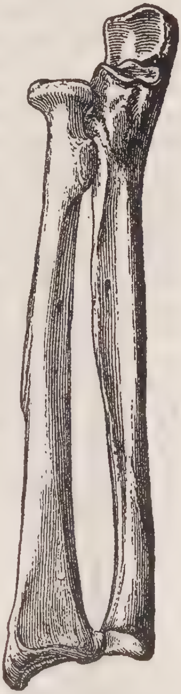


Fig. 37.—Radius and Ulna.

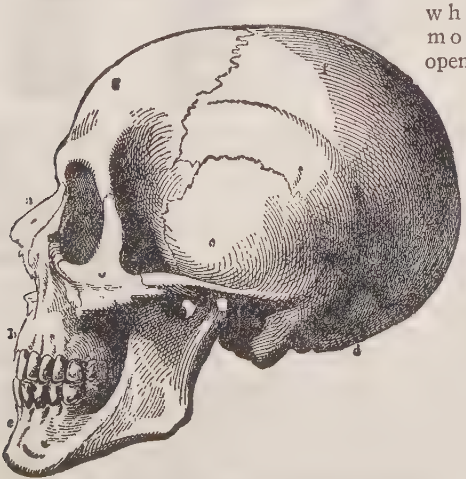


Fig. 38.—Skull, *a,* Nasal bones; *b,* maxilla; *c,* mandible; *d,* occipital bone; *e,* temporal bone; *f,* parietal bone; *g,* frontal bone.

The *teeth* appear in two crops; the first, ten in number in each jaw, are known as the *milk teeth;* at the end of the sixth year they begin to be replaced by the *permanent teeth,* sixteen in each jaw. The second dentition is not concluded until about the twenty-first year, when the wisdom teeth or last molars appear.

Every tooth has a *crown,* the part above the gum, a *neck,* the constricted portion just below the crown, and a *root,* the part embedded in the jaw. In structure (Fig. 39) they are composed of *enamel,* the hard surface covering the *dentine* which comprises the mass of the tooth, the *cement* which covers the root, and the *pulp,* composed of nerves and blood-vessels, which nourishes the tooth and lies in its interior. When the teeth are not properly cared for the protective enamel cover breaks down, exposing the dentine which rapidly decays, undermining the enamel and finally exposing the sensitive pulp; pain then begins, and unless the tooth is filled, death of the pulp occurs and the tooth is lost.

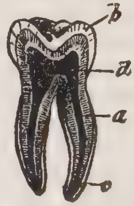
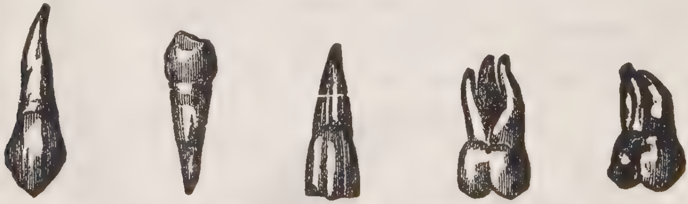


Fig. 39.—Section of Lower Molar. *a,* Dentine; *b,* enamel; *c,* crusta petrosa; *d,* pulp cavity.

The four front teeth in each jaw are adapted to cutting, and are called *incisors;* next to these on each side is a tearer or *canine* tooth, and then two *bicuspids;* all of these usually have a single root. After the bicuspids come three *molars* or grinders on each side. The upper molars usually have three roots, two on the outer side and one on the inner, while the lower molars generally have two roots. A knowledge of the number and arrangement of the roots of the teeth is necessary in order to select the proper pair of forceps to use in tooth extraction (Fig. 40).



Canine or Eye Tooth of Upper Jaw. Second Bicuspid of Lower Jaw. Central Incisor of Upper Jaw. Second Molar of Upper Jaw. Wisdom Tooth of Upper Jaw.

Fig. 40.

Muscles, Cellular Tissue, and the Skin. Muscles consist chiefly of elastic tissue and are commonly known as flesh, or *lean meat.* Each muscle is composed of a number of fibers held together by a *fibro-elastic membrane,* and collected into bundles which are enclosed in a sheath of moderately dense fibro-elastic membrane, the *external perimysium.*

The function of muscles is to move the various parts and tissues of the body; they may contract (shorten) or relax (lengthen) without changing their volume. Their tendency to remain in a state of partial contraction (*tonus*) is constantly present during life. If a muscle is cut the two ends at once pull apart and a gaping wound is left. For the same reason if a bone is broken the contracting muscles on each side of the fracture have a tendency to shorten the limb, making the ends of the bone override each other and produce deformity (Fig. 41). It is this muscular contraction which must be overcome in setting fractures or reducing dislocations.

As muscles taper toward the ends they become more and more fibrous until white, glistening *tendons* or *sinews* are formed which finally blend with the periosteum at the point of attachment to bone.

Most muscles, like those of the limbs, are under the control of the will and are known as *voluntary muscles* (Fig. 42), while others, like those of the heart and intestinal tract, which may function independently of the will, are called *involuntary*. This involuntary action of the important muscles which preside over the necessary functions of life is a wise provision of nature; otherwise one might forget to breathe or make the heart beat, and sleep would be out of the question.

The muscles in their action upon the bones produce various special motions; bending a limb is called *flexion*, straightening it is *extension;* turning the palm down is *pronation*, turning it up *supination;* motion of the limb on its long axis is *rotation*. *Abduction* is throwing a limb out from the body, while drawing it toward the body is *adduction*.

In a variable time after death *rigor mortis* sets in; a chemical change in the muscles occurs whereby they become rigid, and remain so until decomposition begins. When the person has undergone great muscular exertion to the point of exhaustion just before death this change takes place almost immediately, so that the soldier killed in battle may be found rigidly fixed in the same position in which he met his death.

The only voluntary muscles which it is necessary for you to remember are the *sterno-mastoid*, the *biceps*, and the *diaphragm*. Important involuntary muscles are the *heart*, and those of the *gastro-intestinal tract* (*stomach and intestines*) and *bladder*.

The *sterno-mastoid* is the prominent muscle seen on each side of the neck when the head is turned in the opposite direction and extending from behind the ear to the top of the sternum; its front edge is a guide to the carotid artery. The *biceps* is the big muscle on the front of the arm, familiar to all, and the inner border of which is a guide to the brachial artery.

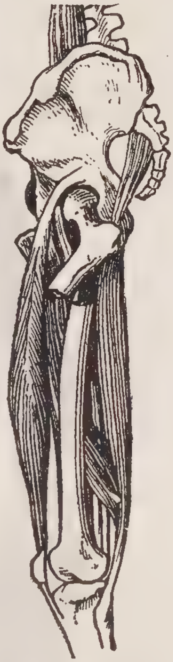


Fig. 41.—Fracture of Thigh. Deformity from muscular action.

The *diaphragm* is the great muscular partition between the thorax and abdomen, and is the chief muscle used in inspiration.

The *connective* or *cellular tissue*, so called because of the spaces contained in its spongy structure, connects together all the other special tissues, and serves as a support for the blood-vessels, nerves, and fat.

The fat is the padding which fills in empty spaces and gives form and pleasing outlines to the body. Its important functions are to serve as a reserve of nutritive material for emergencies, and to act as a blanket in retaining the bodily heat. The emaciation which follows an exhausting illness is largely due to the using up of the reserve fat,

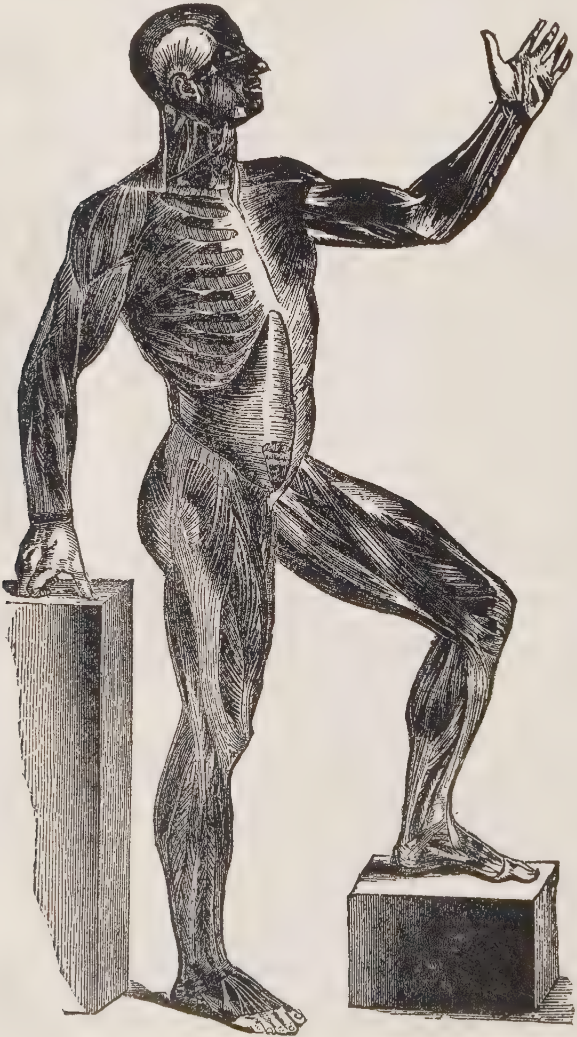


Fig. 42.—Superficial Layer of Voluntary Muscles.

and everyone is familiar with the fact that a fat person stands cold better and heat less well than a thin one.

Skin. The skin is a tough, elastic membrane which covers the entire body and is continuous at the various orifices with the *mucous membrane.* Anatomically it consists of two layers, the *epidermis* or *cuticle,* and the *derma* or *true skin.* The *cuticle* is that part which is raised when a blister occurs and which peels off after scarlet fever. It serves as the protection for the true skin.

The *derma* constitutes the greater part of the thickness of the skin, and contains the blood-vessels, nerves, sebaceous (oil) and sweat glands.

The appendages of the skin are the *hair* and the *nails,* which are modified cuticle (Fig. 43).

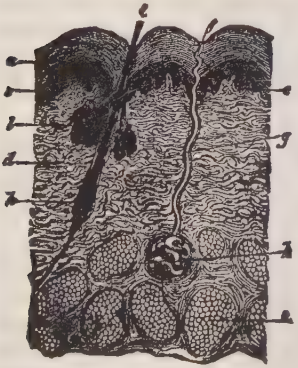


Fig. 43.—Perpendicular Section of the Skin, Showing: *a,* The epidermis, cuticle, or scarf skin; *b,* a layer of dark-colored cells; *c,* the papillæ on the surface of *d,* the corium, derma, cutis vera, or true skin, and *e,* the fat cells underlying it; *f,* a perspiratory pore or aperture, *g,* the duct, and *h,* the coiled substance of a sudoriparous gland; *i,* the shaft of a hair, *k,* its root, and *l,* sebaceous glands communicating with the interior of the hair follicle.

The *sebaceous glands* secrete an oily substance which gives to the skin its softness and pliability; the orifices of the ducts of the sebaceous glands are particularly large about the face and nose, and when plugged with dirt form the familiar *black-heads.*

The sweat glands are in vast numbers all over the body and their orifices constitute what are known as the *pores.* They secrete a variable amount of water, averaging about two pints a day, and the water contains organic matter and salts, and constitutes the *perspiration* or *sweat.*

The functions of the skin are to protect the underlying parts from injury, from the invasion of bacteria and other harmful substances, and from undue evaporation; to receive the nerve ends and thereby serve as a special organ of touch; and through the agency of the sweat glands to act as an important excretory apparatus and a regulator of bodily temperature.

The importance of a whole skin as a protection against the bacteria of disease is well known; subcutaneous wounds, that is, contusions, give us but little anxiety, but if the skin is broken, special dressings must be applied to take its place. Plague frequently invades the body through a break in the protective wall of the skin, and syphilis is sometimes contracted in the same manner.

As a temperature regulator its action is shown by the increased perspiration in hot weather, the evaporation of the water serving to cool the body; conversely, in winter perspiration is imperceptible.

The epidermis or cuticle is comparatively impermeable to water, but when it is soaked in water for some time the cells swell and water is admitted to the true skin where it is absorbed quite readily. Absorption of water occurs readily from abraded surfaces, such as wounds.

Medicinal agents intended for skin antiseptics should preferably be dissolved in water, since they would tend to remain on the epidermis. The skin however, may be used to convey drugs to the underlying organs. Mercury in an oily base is absorbed by the unbroken skin, the pores being thought to be the main avenues of entry. Absorption of medicinal agents from the unbroken skin is always greatest where the epidermis is thinnest, that is, in the axillae, loins, and inner surfaces of the arms and thighs.

Nervous System and Special Senses. The *nervous system* consists of the *brain, spinal cord,* and the nerves constituting the *cerebro-spinal system,* and the *ganglia* and connecting nerves composing the *autonomic,* formerly known as the *sympathetic system.*

The *brain,* situated within the cranium, is the "seat" of the intellect and will, and the central station from which all the orders for motion are sent out and to which all the reports called sensations are forwarded. The *spinal cord* extends downward from the brain through the spinal canal and is largely an aggregation of nerves or wires connecting the brain with all parts of the body. The *ganglia* (Fig. 44) are small masses of nervous matter arranged in pairs along the spinal column and in groups about the heart and great viscera; they are connected with each other and with the cerebro-spinal system, and their distribution is to the heart, lungs, blood-vessels, the gastro-intestinal tract, and the great viscera.

The *nerves* are composed of bundles of minute fibers enclosed in a protective sheath, each of these fibers corresponding to a telegraph wire and ultimately reaching its destination without branching.

The *brain* (Fig. 45) consists of the cerebrum and cerebellum, and pons and medulla. The *cerebrum* is the soft, pulpy, oval mass which is seen when the top of the cranium is removed; it is divided from before backward by a deep fissure, almost, but not quite complete, so that there is a bridge left connecting the two halves.

The surface of the brain presents numerous grooves or *sulci,* between which are the *convolutions.* The exterior is composed of *gray matter,* and the interior of *white matter,* the latter being nothing more than a collection of nerves connecting the various parts of the brain with each other and with the spinal cord. In the interior of the cerebrum are a

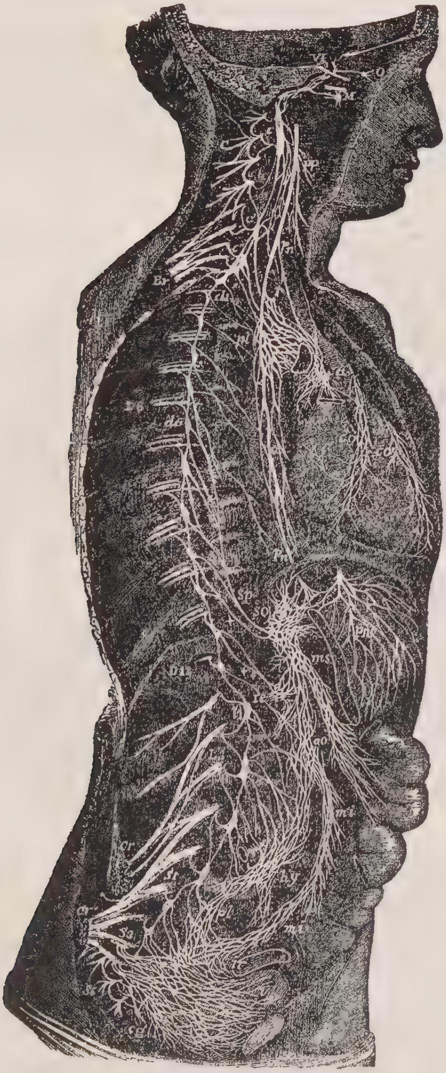


FIG. 44.—Autonomic or Sympathetic System of Ganglia and Nerves.

number of cavities known as *ventricles.* The *gray matter* is the seat of the mind.

The brain is very delicate and easily injured; injuries or even slight pressure seriously interfere with its functions. When a fracture of the skull occurs with depression of bone, or even a slight bleeding from one of the cerebral vessels, pressure of the brain results and we have unconsciousness or paralysis or both; this is the condition in apoplexy which is merely a hemorrhage within the cranium; as the blood cannot escape it must produce pressure.

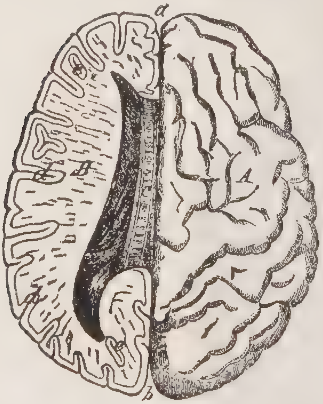


Fig. 45.—The Hemispheres of the Brain. *A,* The right; *B,* the left divided from before backward by *a, b,* the longitudinal fissure, and connected by *c,* the bridge of transverse fibers called the corpus callosum. On the right side the convolutions and sulci are shown; on the left the upper part of the convexity of the hemisphere has been cut away to show the gray matter *d, d,* dipping into the sulci and appearing as islands, *e, e,* in the interior of the white matter; the elongated cavity with curved extremities is the lateral ventricle of that side.

Lining the interior of the cranium is a strong fibrous membrane which protects and suspends the brain and is called the *dura mater;* this with the *pia mater* and *arachnoid* constitute the *meninges* or membranes, inflammation of which is known as *meningitis.*

If we lift up the back part of the cerebrum we see below it a small mass of nervous tissue known as the *cerebellum* or *little brain* (Fig. 46). It is chiefly concerned with the maintenance of the equilibrium of the body.

The *pons* is the connecting link between the cerebrum and medulla, and between the two lobes of the cerebellum.

The *medulla oblongata* is the enlarged upper end of the spinal cord lying just within the cranium, and containing the important nerve centers presiding over the action of the heart, blood vessels, and respiratory movements. It is also the part in which the nerves coming from each side of the brain cross over to the opposite side of the spinal cord, so that an injury of the brain above this crossing causes a paralysis on the opposite side of the body.

Spinal Cord. The spinal cord (Fig. 47), like the brain, is enclosed in membranes and is a tail-like column of nervous tissue composed chiefly of nerves but containing in its interior a central column of gray matter. A pair of nerves leave it opposite each vertebra, those of the cervical region being arranged in two groups. The upper group supplies the face and neck and the interior of the chest; one of the most important of the branches is the *phrenic,* which controls the movements of the diaphragm. The lower group is known as the *brachial plexus* and supplies the upper extremity.

The *dorsal nerves* supply the chest wall, those of the *lumbar* and *sacral* regions go to the pelvis and lower extremities; one great cord which emerges from the pelvis on each side and passes down the back of the thigh is called the *sciatic nerve;* it is often the seat of the neuralgic pain known as sciatica.

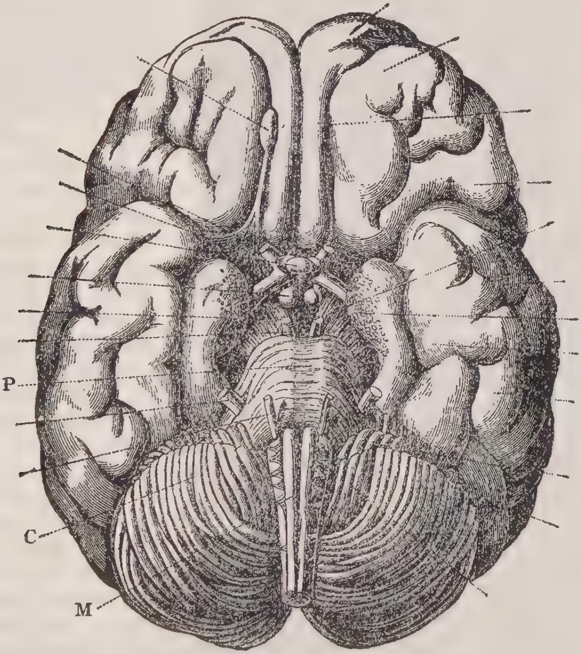


Fig. 46.—Lower Surface of Brain. *C,* Cerebellum; *M,* medulla; *P,* pons.

As all the nerves of the body except those of the face must pass through the spinal cord on their way to the brain, it is evident that if the spinal cord is cut completely across there must be paralysis of all the parts below; such a paralysis is called *paraplegia.* If the injury is high enough up the nerves controlling respiration are involved and death quickly follows. As the motor nerves are collected in the front part of the spinal cord and the sensory nerves in the back part, a partial injury of the cord may cause paralysis of motion without affecting sensation, or *vice versa.*

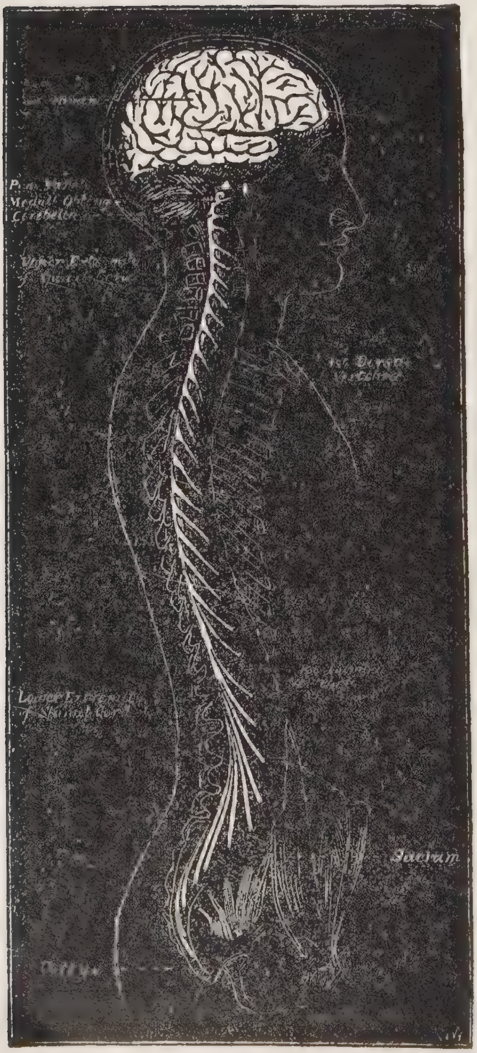


Fig. 47.—Spinal Cord and Nerves.

There are two kinds of nerves, *motor* and *sensory.* The former convey from the brain orders directing motion, while the latter carry to the brain information as to sensation. If a motor nerve is cut the muscles supplied by it are paralyzed because orders from the brain can no longer reach them; if a sensory nerve is cut sensation is lost in the part supplied by it because information as to the sensory condition of the part can no longer reach the brain. Usually nerves contain both motor and sensory fibers, but some nerves, like the facial, are purely motor.

There are certain reports and impressions which are sent by way of the nerves from various parts of the body which it is not necessary to refer to the brain for its action; the necessary action is

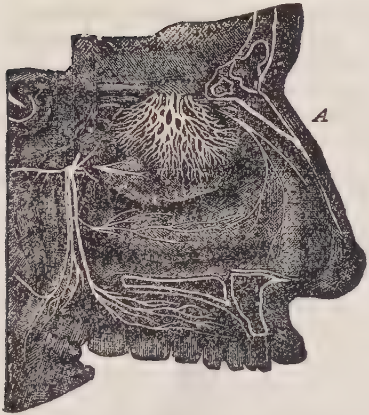


Fig. 48.—Section of Nose. *A*, Olfactory nerves.

provided automatically by what is called *reflex action.*

The quick withdrawal of the hand when it touches something hot and the rhythmical contraction of the heart under the stimulus of its distention with blood are instances of reflex or automatic action.

Special Senses. The special senses are *touch, taste, smell, hearing,* and *sight.* The three latter are presided over by special *cranial nerves,* that is, nerves coming directly from the brain without passing through the spinal cord.

The sense of *touch* is resident in the skin generally, but is most highly developed in the ends of the fingers.

The sense of *taste* is located in the mouth, more especially in the tongue; for its action it is necessary that the substance should be in solution; this is in accordance with our knowledge that insoluble medicines are tasteless.

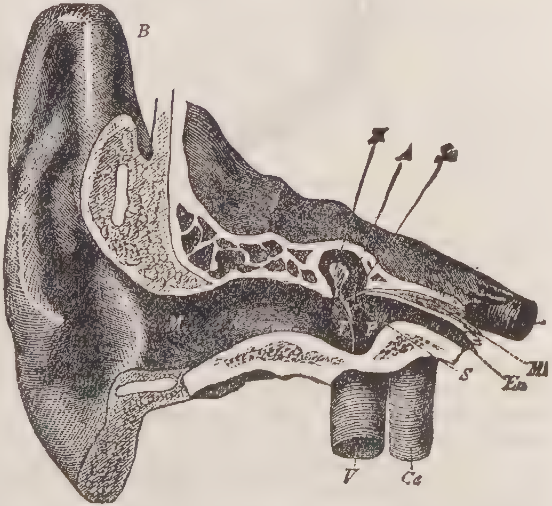


Fig. 49.—Section of the Ear. *B*, External ear; *M*, auditory canal; *T*, tympanum; *P*, middle ear; *H*, ossicles; *E*, Eustachian tube.

The sense of *smell* resides in the upper nasal cavities where the filaments of the *olfactory nerve* are distributed to the mucous membrane (Fig. 48).

Hearing or the perception of sound vibrations is provided for by the ear through the auditory nerve. The ear (Fig. 49) consists of the *external ear,* the *auditory canal,* the *tympanum* or *drum membrane,* the *middle ear,* stretching across which are the small bones or *ossicles,* and the *internal ear.* The tympanum is stretched like a drum-head across the auditory canal, separating the external and middle ears; in order that the air pressure on the two sides of the drum may be equalized there is an air tube leading from the middle ear to the throat and known as the *Eustachian tube;* stoppage of this tube in chronic inflammation of the throat is one of the causes of deafness.

The sense of *sight* consists in the perception of light, color, form, size, and distance; it is resident in the eye.

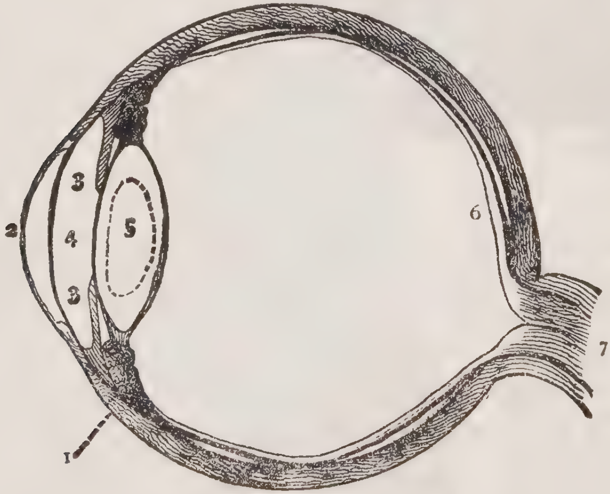


Fig. 50.—Section of the Eye. 1, Conjunctiva; 2, cornea; 3, 3, iris; 4, pupil; 5, lens; 6, retina; 7, optic nerve.

The *eye* (Fig. 50) is situated in the orbit, the projecting upper border of which, together with the quickly moving lids, give it protection. It is covered in front by a thin vascular membrane which also lines the lids and is known as the *conjunctiva.* Light enters through the transparent *cornea* which is set in front of the eye like a watch-glass; behind the cornea is hung a curtain of muscular fibers variously colored and called the *iris;* the black *pupil* is really a hole in the iris to let in the light which then passes through a *crystalline lens* just behind the pupil and is brought to a focus on the *retina;* the retina is merely an expansion of the *optic nerve* which transmits the luminous impressions to the brain. The dense white outer coat of the eye, lying beneath the conjunctiva, is known as the *sclerotic.*

The eye is a camera, focusing being accomplished by changes in the convexity of the lens effected by the contraction of the *ciliary muscle,* the muscle of *accommodation.*

Color-blindness is the inability to distinguish certain colors, particularly reds and greens.

Digestive Apparatus. Inasmuch as the nutritive constituents of the blood are being constantly used up in the repair of tissue and the production of energy, either as heat or work, it is necessary that some provision should be made for a constant supply of new material. This is done by the food through the digestive apparatus; the function of the digestion is to prepare the food for absorption and nutrition.

Foods. Foods are usually classified according to certain definite compounds or *alimentary principles* which they contain; they may be placed under five groups: 1. *Proteins, nitrogenous substances,* or *albuminates;* 2. *Fats* or *hydrocarbons;* 3. *Carbohydrates* or *starches,* and *sugars;* 4. *Minerals,* including *water* and *salts;* 5. *Accessory food substances,* or *vitamines.*

The especial uses of these alimentary principles in nutrition are as follows: *Proteins* essentially serve to replace the cell proteins that have been destroyed by the wear and tear of the body tissues. Proteins are composed of amino-acids, which have been called the "building-stones" of the body. Under certain conditions proteins may serve to produce heat and to do work.

The *fats* are largely stored in the various organs to be used as emergency sources of energy. When the carbohydrate store is exhausted, fats are next drawn upon to be converted into energy. They serve then as a line of defense against protein consumption.

The *carbohydrates* are a very important class of compounds in the maintenance of the body activities. They are first to be utilized in the production of energy and are almost exclusively used for this purpose. They also aid the body in utilizing the fat stores when an emergency arises.

Water and certain *salts,* particularly the salts of sodium, potassium, and calcium, are the chief components of the body cells, and to maintain the salts and water in their proper proportions so that the cells will function normally, both water and salts must be constantly supplied to the body. Neither water nor salts contribute directly to form energy, though both are vital to health.

The *accessory food substances* or *"vitamines"* are substances of unknown chemical nature, which are developed in plants; when vitamine-containing plants are eaten these substances are stored in the various body organs and assist in maintaining health. We, therefore, may obtain vitamines by eating either plant or animal food. The absence of one or others of the vitamines in the diet will produce human diseases such as beriberi, rickets, and scurvy. Growth of the body, fecundity, and the proper utilization of iron by the cells are dependant in part upon vitamines. The vitamines are best obtained by eating plenty of fresh vegetables, fruits, milk, butter, eggs, liver, and whole-wheat bread.

All these alimentary principles are necessary for life; some one or more of them are contained in all foods; if any one food contained them all in proper proportion that substance would constitute a complete diet; milk contains them all and in a complete form for infants, but for adults a mixed diet is necessary. Beef consists largely of proteins, pork of fats, bread of starch, candies of sugar.

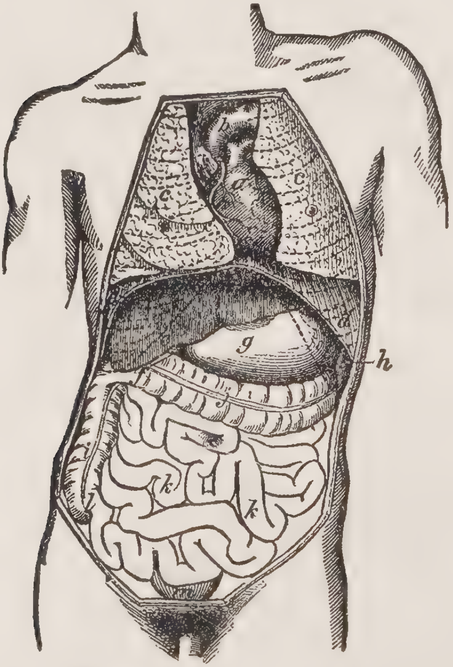


Fig. 51.—View of Thoracic and Abdominal Organs; anterior walls removed, but the relative position of the ribs, navel, etc., indicated. *a*, Heart; *b*, great vessels; *c*, *c*, lungs; *d*, *d*, diaphragm; *e*, liver; *f*, gall bladder; *g*, stomach; *h*, spleen; *i*, ascending colon; *j*, transverse colon; *k*, coils of small intestine; *l*, position of ileocecal valve at junction of small and large intestines; *m*, urinary bladder.

The proper quantity of the various articles of food necessary per day to maintain a man in good health while performing ordinary labor constitutes a balanced *ration*.

Now these alimentary principles, in the form in which they exist in foods, are not ready for absorption; they must be reduced to soluble forms: the albuminates to peptones and amino-acids, the sugars and starches to glucose, and the fats to an emulsion and fatty acids and gylcerine; to accomplish this is the purpose of the digestive apparatus.

When too much food is taken, the excess is not digested, but acts as a foreign body and causes irritation of the stomach and bowels, followed by pain and diarrhea, or the poisonous products of decomposition are absorbed, causing fever—*auto-intoxication*.

A deficiency of food causes the tissues of the body to be drawn upon, and emaciation is the result.

Alimentary Canal. The apparatus for the digestion of the food consists of the alimentary canal, and the salivary glands, liver, and pancreas. The *alimentary canal* includes the mouth, pharynx, œsophagus, stomach, small intestine, and large intestine; it is a muscular tube lined with mucous membrane, about thirty feet long and extending from the lips to the anus (Fig. 51).

In the *mouth* provision is made for the *mastication* of the food and its admixture with saliva; beyond this is the apparatus for swallowing, the *pharynx* and *œsophagus,* which convey the food to the stomach, where a partial reduction and solution of it take place; in the small intestine the digestion and solution are completed, and the nutritive principles, composing the *chyle,* are taken up by the intestinal membranes and pass into the blood, while the portion which is not absorbed passes into the large intestine, where most of it is later expelled from the body.

In looking into the mouth (Fig. 52), we see the teeth and tongue,

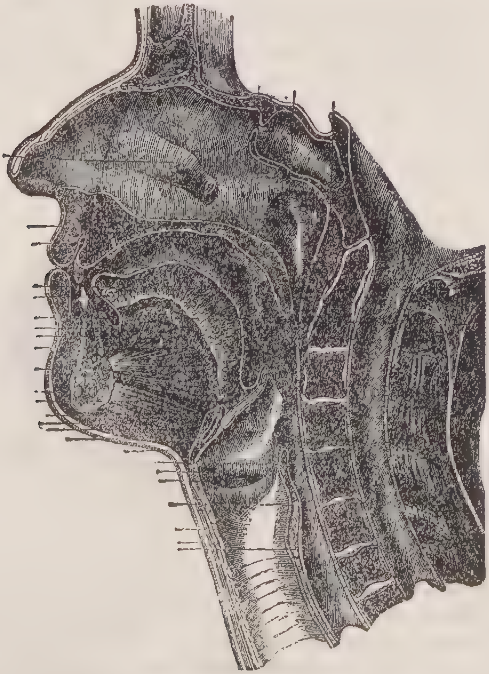


Fig. 52.—Section of Head and Neck.

already described, and, stretching across the upper and back part, a fleshy curtain known as the *palate;* hanging down from the center of the palate is the *uvula,* and on either side behind the palate are the *tonsils.*

In the mouth the food is thoroughly broken up by the teeth and, assisted by the tongue, mixed with the saliva, and formed into a suitable lubricated mass for swallowing. The only digestion which takes place in the mouth is the slight conversion of the starch into sugar; nevertheless thorough mastication is of the greatest importance, as, the more completely the food is broken into small particles, the more easily the digestive fluids of the stomach and intestines get at the particles to dissolve them. If we wish to dissolve out the soluble constituents of a crude drug, we first pulverize it in a mortar, and the same principle obtains here.

After the food has been masticated, it is pushed into the pharynx by the tongue, and there passes beyond the control of the will through the eight or nine inches of the *œsophagus* or gullet, into the stomach.

The saliva comes from the *salivary glands,* which are three in number on each side, the *parotid, submaxillary, and sublingual.* The parotid glands are situated just in front of and below the ear, and are the seat of the inflammation known as *mumps.* The other salivary glands are placed below the tongue and lower jaw.

The *stomach* (Fig. 53) is a muscular bag lined with mucous membrane, pear shaped, with the large end to the left and lying in the upper part of the abdomen, largely behind the ribs, and separated from the thoracic cavity by the diaphragm. The heart is just above it, with only the diaphragm between, so that it can easily be seen how distention of the stomach may cause disturbances of the heart, and how pains in the stomach are so often referred to the heart.

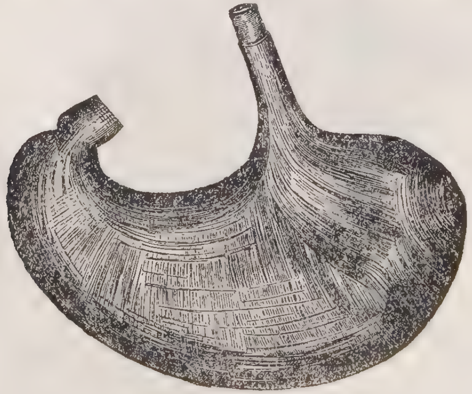


Fig. 53.—Stomach.

The stomach opens into the œsophagus at one end, and into the small intestine at the other, by small openings known as the *cardiac* and *pyloric* orfices, respectively. The *small intestine* is about twenty-five feet long, and lies in the central and lower part of the abdomen, extending from the stomach to the right groin, where it terminates in a valvular opening into the large intestine.

The *large intestine* is about five feet long. It commences at the termination of the small intestine in the right groin, this part of it being known as the *cecum* and having attached to its lower and back part a tail-like appendage known as the *vermiform appendix;* this appendix, about the size of a goose quill and two to five inches long, is the part which is so frequently inflamed, constituting the disease called *appendicitis.*

The cecum as it passes up the right side of the abdomen is known as the *ascending colon;* under the liver it turns and crosses to the left in front of the stomach, becoming the *transverse colon;* on the left side of the abdomen it turns downward, the *descending colon;* in the left groin it makes a curve like the letter S, the *sigmoid flexure,* and ends in the *rectum,* which descends to the right and backward, to the anus.

The intestines are covered with a smooth, shining membrane which lines the abdomen and is known as the *peritoneum;* inflammation of this membrane is called *peritonitis.*

The *omentum* is a sort of apron made of a fold of the peritoneum, containing much fat, which lies over the intestines and protects them. The *mesentery* is the name applied to other folds of the peritoneum which bind the intestines loosely to the abdominal walls behind them. In the abdominal walls are certain weak places where blood-vessels pass out of the cavity, and the intestines have a tendency to follow the vessels; these places are the *umbilicus* or *navel,* the *inguinal canal,* along which the vessels pass to the testicle, and the *femoral canal,* for those to the thigh. When the intestine does so escape we have *hernia; umbilical, inguinal,* or *femoral,* respectively.

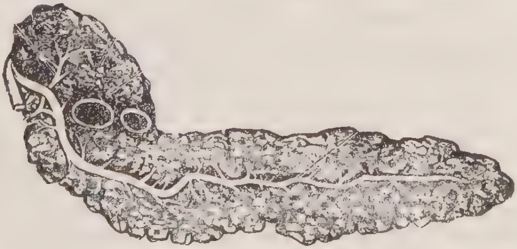


Fig. 54.—Pancreas in Section to Show Its Duct.

In the upper part of the abdomen, on the right side and extending somewhat to the left, we have the *liver* (Fig. 51); it is the largest gland in the body, weighing between four and four and a half pounds, and in its natural state lies almost wholly behind the ribs. The liver has two large lobes, between which and projecting just beyond the ribs is the *gall* *bladder,* which empties by a narrow duct into the small intestine, just beyond the stomach.

To the left of the stomach and also behind the ribs is another gland, which has no duct, called the *spleen;* it is dark colored and about the size and shape of the hand without the fingers.

Deeply placed behind the stomach and extending transversely across the abdomen is a slender tongue-shaped gland, the *pancreas* or *sweetbread* (Fig. 54). It is about six inches long by three-fourths of an inch broad, cream colored, and has a duct which terminates in the small intestine together with the common bile duct.

In the stomach the food which has already been masticated and part of the starch converted into maltose by the action of the saliva is brought into contact with the *gastric juice;* this juice is a sour liquid, containing pepsin and hydrochloric acid, secreted by the countless small glands found in the mucous lining of the stomach. This is the same pepsin and hydrochloric acid which are used outside the body to digest milk and other albuminates. The contraction of the muscular walls of the stomach, caused by the presence of food, thoroughly mixes it with the gastric juice, and continues this churning motion as long as the food remains.

Under this process albuminates are partially converted into peptones, a form suitable for absorption, and amino-acids. The solution of the albuminous intercellular materials aids in the liquefaction of other food principles, which pass slowly out of the stomach into the intestine in the form of a whitish fluid known as *chyme.* The process of stomach digestion requires from one to four hours, depending upon the character of the food, the thoroughness of mastication, and other factors.

The mucous lining of the small intestine is thrown into numerous folds known as *valvulæ conniventes,* the purpose of which is to increase the extent of surface, and this is still further accomplished by the innumerable *villi* or tiny projections which stud the surface of the mucous membrane and give it a velvety appearance. There are also millions of small *glands* or *follicles* which secrete the *intestinal juice,* an important aid to digestion. Beside the intestinal glands we have already seen that the liver and pancreas empty their secretion into the small intestine at its upper part.

The *functions of the liver* are many; the most important are the production and storage of sugar, the production of urea, and the secretion of bile. The *bile* helps to emulsify and digest fats, stimulates the intestinal muscle to contraction, acting as a laxative, and prevents putrefaction of the intestinal contents. It is a familiar fact that when bile is absent from the intestine, as in some forms of jaundice, constipation and very offensive stools are apt to result.

The *pancreatic juice* digests all three main classes of food; proteins, starches and sugar, and fats.

Unlike the gastric juice, it is alkaline and incapable of acting efficiently unless the proper degree of alkalinity is maintained.

To digest foods outside of the body we now use pancreatin and soda almost to the exclusion of pepsin and acid.

Under the combined influence of all these intestinal juices the chyme is soon converted into a milky liquid known as *chyle,* and this is absorbed by both the capillaries of the intestinal tract, whence it passes to the liver through the *portal veins,* and by the *lymphatics* or *lacteals,* another system of vessels which, arising in the *villi,* passes through a number of *lymphatic glands* situated in the mesentery and known as the *mesenteric glands,* to reach a large duct known as the *thoracic duct,* which passes up the left side of the spinal column and empties into the left subclavian vein, just before its junction with the left internal jugular.

The *spleen* has no direct part in digestion, but it does serve indirectly by acting as a reservoir for the storage, in the intervals of digestion, of the additional amount of blood needed during digestion. Other important functions of the spleen are the production of leucocytes, the destruction of erythrocytes, and the production of uric acid.

Passing on down the small intestine, the intestinal contents become more and more solid by the absorption of the liquid chyle, and this process is continued in the large intestine until finally the indigestible residue is cast out of the body as feces.

Some digestion and absorption takes place in the large intestines, as we know from what occurs when we use nutrient enemata. Water, dextrose, and sodium chloride (salt) are absorbed effectively from nutrient enemas. Dextrin is easily digested by the large intestine, and then absorbed. Alcohol and amino-acids are readily absorbed, but fats and proteins are not absorbed.

When digestion is incomplete from any cause, putrefactive changes may occur in the undigested portion of food and the poisons resulting therefrom may be absorbed, giving rise to fever, headache, and other symptoms of auto-intoxication.

Circulatory System. The *circulatory system* includes the *lymphatic system,* the *blood,* and the *blood-vascular system.*

The *lymphatic system,* (Fig. 55), includes the *lymphatic* and *lacteal vessels,* and the *lymphatic glands.*

The *lymphatic vessels* are modified veins and are found in all parts of the body, wherever there are blood-vessels; they contain lymph, a colorless fluid closely resembling blood, in which the red blood cells are lacking or few in number. Those of the intestine contain a milky fluid during digestion which gives to these particular lymphatics the name of *lacteals.* The lymph is the fluid which comes in contact with the tissues directly and may be regarded as the "middleman" between the blood and the tissues. All over the body also are found *lymphatic glands,* varying in size from a pin head to a small almond; all the lymph passes through these glands before it reaches the blood by way of the thoracic (Fig. 56) and lymphatic ducts. The lymphatic system has an important function in connection with the elaboration of the blood, more and more blood cells appearing in the lymph as it passes through successive chains of glands.

The glands also serve a very useful purpose in resisting the invasion of the body by disease germs.

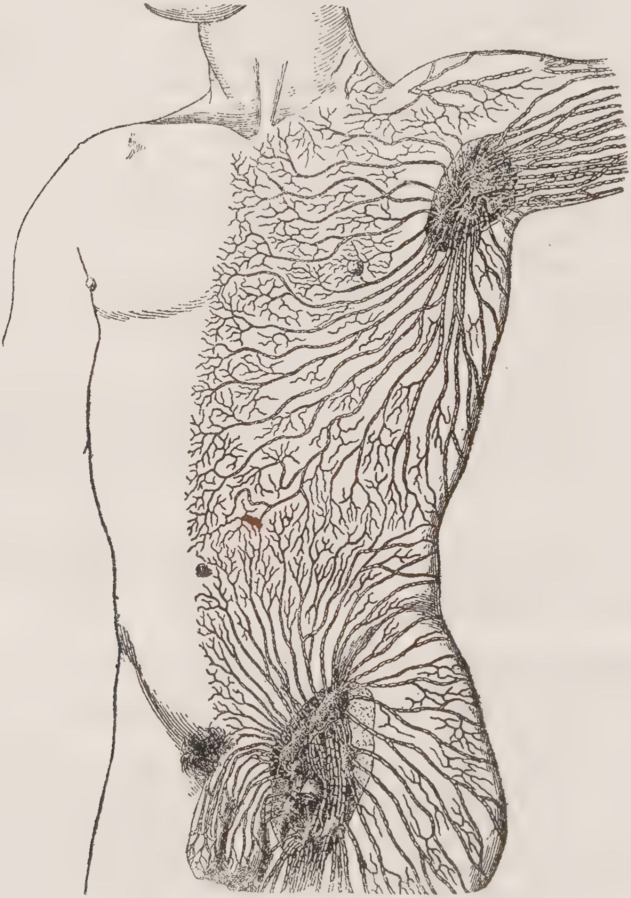


Fig. 55.—Lymphatic System of Trunk, Genitals, and Upper Arm.

In the case of an infected finger wound, for instance, one sometimes sees fine red lines running up the arm and the patient complains of a *kernel* in the arm-pit; the red lines are inflamed lymphatics and the kernel is an inflamed gland; again, in the case of a sore on the penis the glands in the groin swell, constituting a *bubo*.

Certain groups of lymphatic glands are important owing to their connection with special diseases.

A characteristic of syphilis is an enlargement of the *inguinal, epitrochlear,* and *post-cervical glands,* found respectively in the groin, just above and behind the inner elbow, and at the junction of the neck with the back of the head.

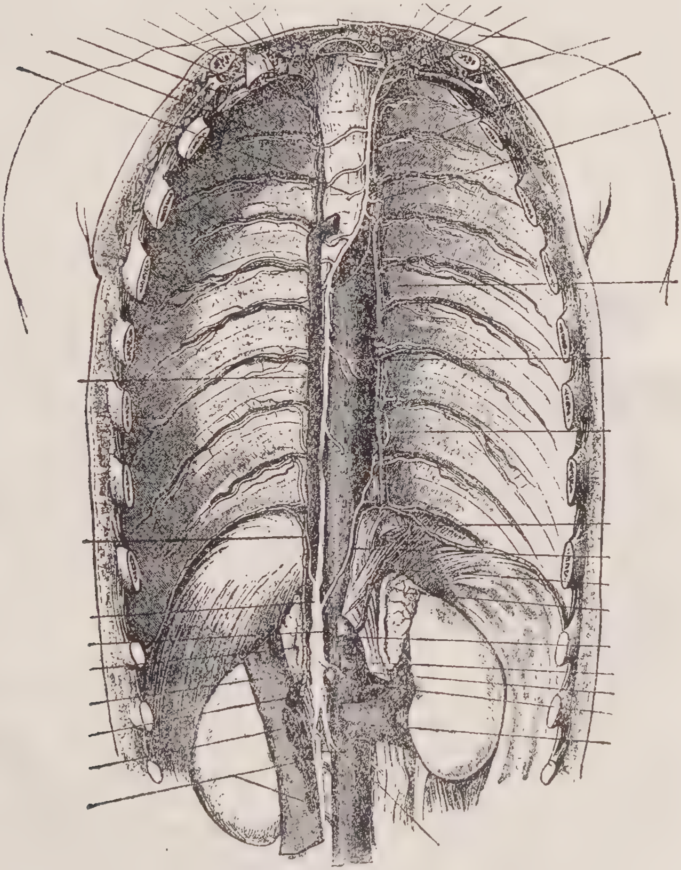


Fig. 56.—Thoracic Duct.

The inguinal glands also become inflamed in other venereal diseases. The glands in the front of the neck become enlarged, cheesy, and sometimes suppurating in the condition commonly called ***scrofula,*** really a tuberculous invasion through the mouth.

Blood. The *functions of the blood* and ***blood-vascular system*** are to receive from the lungs and alimentary tract and to carry to all parts of the body the materials necessary for its nutrition and proper temperature and moisture, and to carry away to the excretory organs the waste matters which if retained would prove poisonous. It has also important functions in the protection of the body from the invasion of the bacteria of disease.

The total quantity of blood is usually estimated at one-twelfth of the weight of the body, or an average of about a gallon and a half.

The blood is red in color; bright red in the arteries, dark red in the veins. It is composed of *cells* or *corpuscles* floating in a liquid, the *plasma.*

The cells are of three sorts, the *red cells* or *erythrocytes,* the *white cells* or *leucocytes* (Fig. 57), and the *blood-plates.* The red cells are much the more numerous, there being about five hundred times as many as there are of the white. They are very small, about one three-thousandth of an inch in diameter, and, though red in mass, the individual cells are seen under the microscope to be light yellow in color. They are round, flattened discs, like a copper cent, except that they are concave on each side, and are largely composed of ***hemoglobin,*** a substance containing iron which has a great oxygen-carrying capacity.

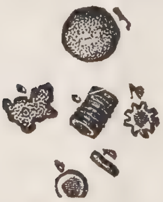


Fig. 57.—*a, b, c, d,* Red cells, side, edge, in rouleaux, crenated; *e, f,* white cells.

The leucocytes are not flat like a cent, but spherical like a ball, a little larger than the red cells, composed of *protoplasm,* and capable of changing their own form and of making their way through the unbroken walls of the blood-vessels. The blood-plates are disk-shaped bodies whose entire function is not clearly understood. They seem to be a necessary aid in the coagulation of blood.

The *plasma* consists of ***serum*** and the elements of ***fibrin;*** when bleeding occurs the fibrin at once forms and the blood ***coagulates*** or *clots;* but for this property of the blood hemorrhages would never stop.

Serum, which is plasma less fibrin, contains the principal nourishing ingredients of blood—albumin, fats, sugar, salts, and gases.

In a general way the blood current may be likened to a river and the cells to boats floating upon it; the red cells are the freight boats loaded with oxygen which they receive in the lungs and carry to all parts of the body; the white cells are the war ships, always on the alert for an attack by disease germs; when such an attack occurs the leucocytes hurry to the invaded point and a battle ensues in which there are killed and wounded on both sides; the blood-plates act as groups of skilled workmen to stop leaks in the river banks; the dead white cells, when in large number, constitute *pus* or *matter.* The blood serum itself not only carries nourishment to all parts of the body, but, coming back, acts as a sewer, bringing away the waste products, both liquid and gaseous.

In order to maintain a constant circulation of the blood, a complete system exists, consisting of a constantly acting pump, the *heart,* the *arteries* which carry the pure blood to all parts of the body, the *capillaries* from which the blood delivers its nutritive materials to the tissues and takes on a load of waste products, and the *veins* which return the impure blood to the right side of the heart; this is the *systemic circulation* and requires about a half a minute for the entire trip; then there is a subsidiary system known as the *pulmonary circulation,* whose arteries take the impure blood from the right side of the heart to the lungs, in the capillaries of which it is purified, losing carbonic acid and waste matters, taking on a load of oxygen, and then passing through the pulmonary veins to the left side of the heart for another trip through the systemic circulation. (See Plate, Fig. 60.)

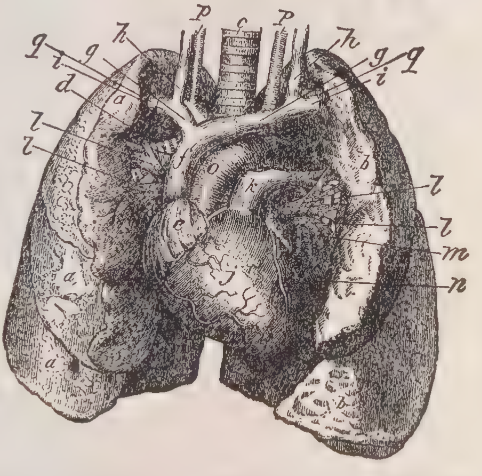


Fig. 58.—The Thoracic Organs. *a,* Right lung divided into three lobes, and *b,* left lung into two lobes, their anterior margins thrown back to expose the deeper parts; *c,* trachea, with its cartilaginous rings; *d,* right bronchial tube; *e,* right auricle, receiving from above, *f,* the superior vena cava which is formed by the junction of *g, g,* the right and innominate veins, and each of these by the confluence of *h, h, i, i,* the jugular and subclavian of its own side; *j,* the right ventricle, giving issue to *k,* the pulmonary artery, which divides into two branches, that for the right lung passing behind the other great vessels; *l, l, l, l,* pulmonary veins, bringing oxygenated blood to *m,* the left auricle; *n,* the left ventricle, from which the blood is carried to the organs and tissues by *o,* the aorta; *p, p, q, q,* carotid and subclavian arteries, given off from the arch of the aorta.

Heart. The *heart* is a conical hollow muscle, situated between the lungs and behind the sternum and enclosed in a fibrous sack, the *pericardium* (Fig. 58). It is about the size of a closed fist, its average weight being three-fourths of a pound. The apex is found between the fifth and sixth ribs, just inside of the nipple line. It is divided by a vertical partition into two lateral halves which have no communication with each other. Each of these lateral halves is further subdivided by a horizontal constriction into two communicating cavities, an *auricle* and a *ventricle*; the whole heart is lined by a smooth membrane, the *endocardium,* and all its openings are protected by *valves* (Fig. 59).

The right is the venous side of the heart; its auricle receives the venous blood from the entire body through the superior and inferior *vena cava;*

when it is full it contracts and passes the blood into the right ventricle, which in its turn contracts and sends the blood to the lungs, whence it is returned arterialized to the left auricle, and from there to the left ventricle which forces it through the arteries to all parts of the body. This contraction or beating of the heart takes place about seventy-two times to the minute. The valve between the auricle and the ventricle on the left side is known as the *mitral,* that on the right side as the *tricuspid,* while the valves which prevent regurgitation or back-flow from the aorta and pulmonary arteries are known as the *aortic* and *pulmonary,* respectively.

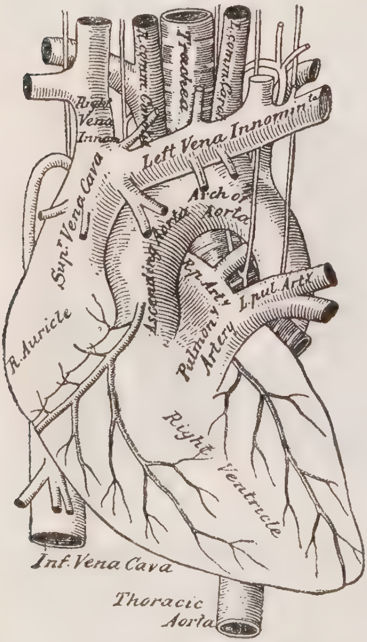


Fig. 59.—The Heart.

Vessels. The *arteries* are elastic, muscular tubes, which stand open when cut across, and are without valves except at their exit from the heart, hence when they are cut the blood will come from the severed vessels in spurts; this is one way of telling whether an artery is cut. The elastic tissue in their walls allows them to expand when blood is forced in from the heart, and by subsequent contraction to maintain a uniform pressure between heart-beats. It is this expansion, caused by the heart forcing more blood into the already full arteries, which constitutes the *pulse.* The muscular tissue allows of a local regulation of the circulation under nervous influences such as occur in blushing or the pallor of fear.

The arteries freely communicate with each other by the anastomosis of small branches, so that when an artery becomes blocked by a clot, or is tied, the blood goes around the obstruction by means of the communication between the small branches given off on either side and the *collateral circulation is established.* It is by reason of the freedom of this collateral circulation that both ends of a cut artery spurt, and but for it gangrene might ensue when an artery is tied.

By the constant giving off of branches the arteries become smaller and smaller until they finally terminate in the capillaries.

The *capillaries,* so called because of their resemblance to minute hairs, though they are much smaller than the finest hairs, differ from the arteries in being of a uniform size throughout, and for the most part in having

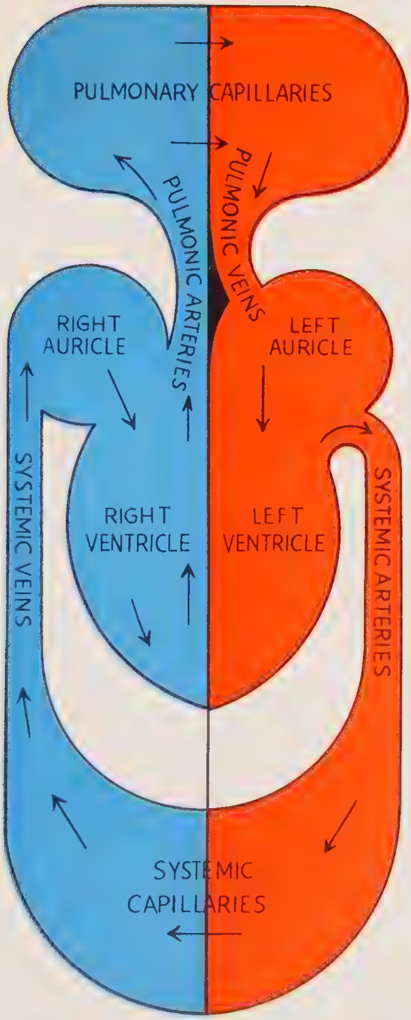


Fig. 60.—Diagram to show the course of the blood in passing from a given point through the two sets of capillaries to the starting point.

The Medical Soldier.

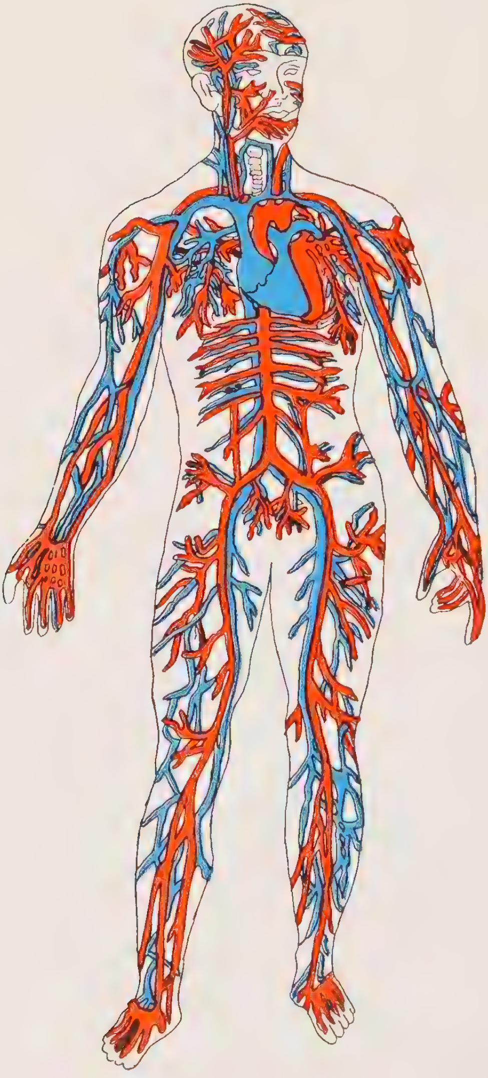


Fig. 61.—The Circulation, Venous and Arterial

only a single thin cellular coat through which the ultimate interchange of materials takes place between the blood and tissues.

The smallest *veins* start from the capillaries and constantly join each other, growing larger and larger, until finally all the venous blood in the body enters the right side of the heart through the superior and inferior vena cava. The pulmonary veins, unlike other veins, return arterial blood from the lungs to the left auricle.

Veins differ from arteries in the following particulars: *Veins:* The contained blood is dark red; it flows in a continuous stream without spurting; it flows toward the heart. The veins have thin walls so that they collapse when cut across; bleeding occurs only from the far end of the cut vein, because the valves (Fig. 62) with which all veins (except those of the rectum) are supplied prevent a backward flow of blood from the near end. Many veins are superficial and may be seen under the skin.

Arteries: The contained blood is bright red; it flows in waves, and spurts from the vessel when cut; it flows away from the heart. Arteries have thick walls and stand open when divided, like a piece of hose; bleeding occurs from both ends, owing to the absence of valves and the freedom of the collateral circulation. The large arteries are deeply placed near the bone and are usually on the inner or protected side of a limb. The circulation of the blood in the arteries is effected by the pumping action of the heart. In the veins the action of the heart is only one factor, the other two being pressure of the muscles in exercise and the aspirating power of the chest in inspiration. When the muscles contract they press on the thin-walled veins, and, as the blood is prevented from going backward by the valves, it must go toward the heart.

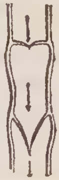


Fig. 62.—The Valves of a Vein.

When any obstruction exists in the course of a vein it is apt to become enlarged or *varicose;* such enlargements we see in the leg, constituting *varicose veins,* in the scrotum, called *varicocele,* and about the anus, called *hemorrhoids* or *piles.*

Arteries. All the arterial blood leaves the left ventricle of the heart by means of a large artery, called the *aorta* (Fig. 61); this vessel arches backward over the root of the lungs, to the left side of the spinal column, down which it passes to the fourth lumbar vertebra, where it divides into the *common iliacs.* From the *arch of the aorta* are given off three large vessels, the *innominate,* the *left common carotid,* and the *left subclavian;* the innominate soon divides into the *right common carotid* and *right subclavian,* so that at the root of the neck the two sets of arteries are symmetrical. The *common carotids* on each side pass up alongside the trachea, or windpipe, where they can be felt, to the upper border of the thyroid cartilage, or "Adam's apple," where they are divided into the *internal* and *external carotids.*

The *internal carotids* supply the interior of the cranium; they lie just behind the tonsils on the inside of the throat. The *external carotids* supply the exterior of the cranium and face, and the tongue; the front edge of the sterno-mastoid muscle is the guide to this artery; the *external carotid,* or better, the *common carotid,* may be compressed against the vertebral column. The *facial,* a branch of the external carotid, curves over the lower jaw about an inch in front of its angle and can be compressed there; the *temporal,* another branch, passes up just in front of the ear and divides into an *anterior* and a *posterior temporal branch.* The *superior* and *inferior coronary branches* of the facial unite with those from the opposite side to form a complete arch in each lip.

The *subclavian artery* passes across the first rib just behind the clavicle, then beneath the clavicle to the axilla, where its name changes to axillary; in the hollow behind the clavicle the subclavian can be felt and compressed against the rib. The *axillary artery,* where it passes beyond the armpit, is called *brachial;* the *brachial artery* extends from the lower margin of the axilla down the inner and anterior aspect of the arm, and terminates about a half inch below and in front of the bend of the elbow, where it divides into the *radial* and *ulnar.* The course of the brachial artery is roughly indicated by the inner seam of the coat sleeve, or by a line drawn from the armpit along the inner border of the biceps muscle to the front of the elbow; it may be compressed against the humerus.

The *radial artery* passes down the radial side of the arm to the wrist, where it winds around the outer side and then passes forward to the palm between the thumb and index finger; the *ulnar artery* in like manner passes down the ulnar or inner side of the arm and divides into two branches which anastomose with two similar branches from the radial, forming the *superficial* and *deep palmer arches.* Both the radial and ulnar are deeply buried under the muscles until just above the wrist where they become superficial; it is at this point that the beating of the radial is felt for in taking the *pulse.* The position of the palmar arches is important, because, owing to the fact that they receive branches from the radial and ulnar arteries, bleeding from them is profuse and requires for its control pressure on both vessels. The *superficial palmar arch* is on a line with the lower border of the extended thumb, while the *deep palmar arch* is a half inch higher up.

The *digital arteries,* which supply the fingers, are branches of the palmar arches and pass along both sides of each finger.

In the thorax the aorta gives off the *intercostals,* which run along the inner surface of the upper and lower borders of each of the ribs; in the abdomen it gives off important branches to all the abdominal viscera, and divides into the common iliacs. The *common iliac* on each side passes downward and outward to the margin of the pelvis where it divides into the external and internal iliac. The *internal iliac artery* goes to the interior of the pelvis and supplies it together with its viscera and the generative organs. The *external iliac artery* passes downward and outward to the fold of the groin, where it enters the thigh and becomes the femoral. The *femoral artery* commences at the center of the groin and passes down the front and inside of the thigh to the back of the knee, where it is known as the popliteal; its course may be shown by stretching a string from the center of the groin to the back of the knee; just below the groin it may be compressed against the head of the femur.

The *popliteal artery* extends from the termination of the femoral to just below the knee where it divides into the anterior and posterior tibial; it is so tightly held down under fascia and tendons that it is hardly accessible for compression. The *anterior tibial artery* passes forward between the tibia and fibula to the front of the leg and then down deeply beneath the muscles to the front of the ankle, where it becomes the *dorsalis pedis artery* which is distributed to the back of the foot. The *posterior tibial artery* gives off a large branch, the *peroneal,* and then passes down the back of the leg beneath the deep muscles to the inner ankle, where it passes to the sole of the foot and divides into two branches, the *internal* and *external plantar,* which supply the toes with *digital arteries* having the same distribution as those of the fingers. Behind the inner ankle the posterior tibial may be felt and compressed.

Veins. The veins may be divided into three sets, the *pulmonary,* the *systemic,* and the *portal.*

The *pulmonary veins* differ from all others in that they convey *arterial* blood from the lungs to the left side of the heart; conversely, the *pulmonary artery* conveys *venous* blood from the right ventricle to the lungs.

The *systemic veins* (Fig. 61) are arranged in two sets, deep and superficial; the *deep veins* accompany their corresponding arteries, each of the large arteries of the leg, forearm, and arm having two veins; the deep veins communicate with the superficial set. The *superficial veins* lie just under the skin where they can, in many localities, be plainly seen; those of the lower extremity are the *internal saphenous,* which starts on the top and inner side of the foot, runs up the inside of the leg and thigh and terminates in the femoral just below the groin; and the *external saphenous,* starting in like manner on the outer side of the foot, and emptying into the *popliteal vein* behind the knee.

Those of the upper extremity are the *radial vein* on the outer side, the *ulnar* on the inner side, and the *median* in the middle; opposite the bend of the elbow the median splits into two veins, the one, known as the *median cephalic,* joining with the radial to form the cephalic, and the other, the *median basilic,* uniting with the ulnar to form the *basilic;* the basilic and cephalic both empty into the *axillary.* The *median cephalic* is the vein ordinarily opened in the operation known as "bleeding." The great superficial vein of the neck is the *external jugular,* which passes down from the angle of the jaw to the middle of the clavicle; it may be brought into view by pressing with the finger just above the middle of the clavicle.

The *portal system* is composed of four large veins which collect the venous blood from the viscera of digestion. The trunk formed by their union (*vena porta*) enters the liver and breaks up into capillaries from which another set of veins, the *hepatic veins,* arise, which terminate in the *vena cava.* This circulation is for the purpose of subjecting the products of digestion contained in these veins to the special action of the liver before they go into the general circulation.

Respiratory Apparatus. The respiratory apparatus consists of the larynx, trachea, bronchi, and lungs (Fig. 63); the thyroid gland, which lies upon the trachea, may be conveniently considered in this connection.

The *larynx,* or *Adam's apple,* is the organ of voice, and is situated in the middle line of the neck, where it may be felt and seen moving up and down in the act of swallowing. It lies between the trachea and the base of the tongue, and its upper opening is closed during swallowing by a cartilaginous flap called the *epiglottis;* when the tongue is drawn well forward, especially if the patient gags, the epiglottis may be seen as a white cartilage curving forward over the root of the tongue. When one chokes in swallowing because the food is said to have "gone the wrong way," it means that the epiglottis has failed to close efficiently the opening into the larynx, and food has gotten in, causing coughing for its expulsion.

The larynx is composed externally of cartilage; internally two white fibrous bands stretch from front to rear, and are known as the *vocal cords;* it is the vibration of these vocal cords that produces sound.

The *trachea* or *windpipe* is a cartilaginous and membranous tube which extends downward about four and one-half inches from the larynx to its division into the two *bronchi,* one of which goes to each lung. The cartilages of the trachea and bronchi are arranged in rings, and serve the purpose of keeping the windpipe open. The *right bronchus* is larger and shorter than the left, and foreign bodies which get into the windpipe usually lodge in this bronchus.

The bronchi divide and subdivide and give off branches like a tree, at the same time gradually losing their cartilages and getting thinner and thinner until the little bronchioli terminate in a sack the walls of which are studded with *air cells,* a terminal bronchus and its air cells resembling a bunch of grapes.

The termination of the bronchi together with the air cells constitutes the lung tissue proper.

When the larynx becomes obstructed by disease so that air cannot get into the lungs and death is otherwise imminent, a tube is introduced into the larynx between the vocal cords, *intubation,* or an opening is made into the trachea and a tube inserted there, *tracheotomy.*

Lungs. The *lungs* are the essential organs of respiration; they are commonly known as "lights," and with the heart between them fill the entire chest cavity (Fig. 58). Each is covered by a smooth, shining *serous membrane* which also lines the chest cavity and is called the *pleura.* Ordinarily the lungs are everywhere in contact with the chest walls, but when an opening is made in the chest, as by a shot or stab wound, or when inflammation of the pleura occurs and fluid is poured out, a space is formed between the lung and the chest wall, known as the *pleural cavity* (Fig. 64).

The right lung has three lobes, the left lung two, and each is composed of bronchi, air cells, and the divisions and subdivisions of the pulmonary arteries and veins.

In the ultimate air cells the venous blood of the pulmonary arteries circulating in the capillaries is brought in contact with the air in the cells, and the interchange takes place which results in the blood receiving a supply of oxygen and becoming arterial, while the air becomes charged with carbonic oxide, waste organic matter. and watery vapor.

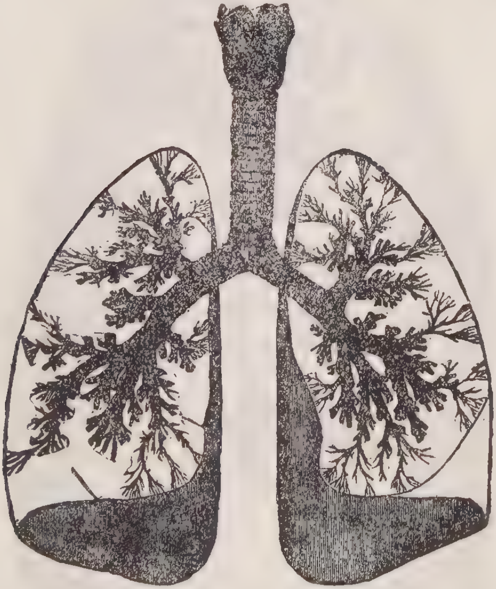


Fig. 63.—The Larynx, Trachea, Right and Left Bronchus, and the Lungs. The latter have been cut open to show the method of division and subdivision of the bronchi.

In inflammation of the lungs, *pneumonia,* these air cells become filled with *plasma,* containing some red blood cells, so that air can no longer enter and that portion of the lungs is temporarily useless. In *laryngitis* and *bronchitis* mucus is poured out into the bronchi and coughed up, but the air cells are free; hence those affections are much less serious.

Breathing or *respiration* consists in the alternate expansion and contraction of the chest, by which air is drawn in and forced out; the drawing in is known as *inspiration* and the forcing out as *expiration.* In ordinary breathing inspiration is an active process whereas expiration is a passive one. The number of these movements in health is about eighteen to the minute. In ordinary quiet respiration the principal muscle concerned is the diaphragm, which in its relaxed state is arched upward into the cavity of the chest; in its contraction the muscle is flattened out, largely increasing the capacity of the chest, so that the air rushes in through the larynx to fill the vacuum; inspiration completed, the diaphragm relaxes, the chest walls collapse, and expiration occurs. When respiration becomes more active the intercostal muscles, which raise the ribs, come into play, and when still more effort is required all the muscles attached to the chest come into action, and even the nostrils are dilated to allow the entrance of more air.

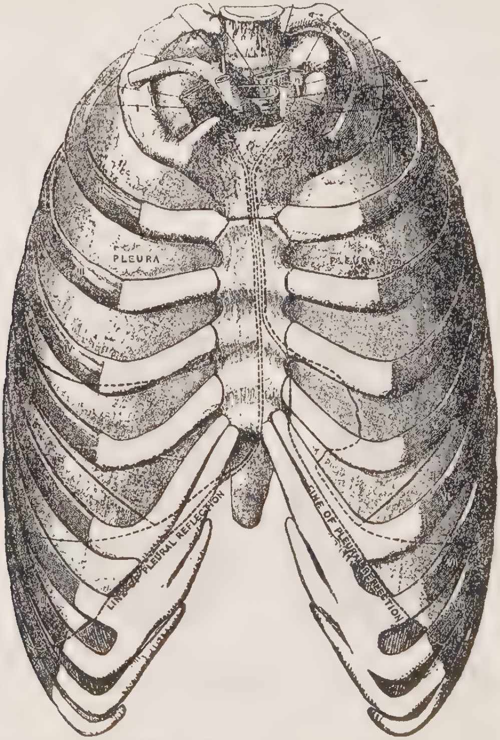


Fig. 64.—Chest, showing Pleuræ.

Ordinary outdoor air contains about twenty-one parts of oxygen, seventy-nine parts of nitrogen, and four hundredth parts of carbonic acid, or four parts in ten thousand.

The *oxygen* is the element of the air which is necessary to sustain life; it serves the same purpose as it does in a fire; maintains the combustion by which heat and energy are produced. If you shut off the supply of air (oxygen) to a furnace the fire goes out; if you shut off the supply to the lungs life goes out. The nitrogen has no other value than to dilute the oxygen.

When air is breathed it loses a portion of its oxygen, is raised in temperature, and has added to it in the lungs carbonic acid, organic matter, and the vapor of water; the amount of contained carbonic acid is increased a hundred times, to about four per cent.

As the air in a confined space is breathed over and over again, headache and drowsiness are experienced, and even death may result.

A notable instance of this character occurred in India in the year 1756, when one hundred and fifty-six British prisoners were confined in a dungeon eighteen feet square; the next morning one hundred and twenty-three of them were dead.

The causes of these results were formerly supposed to be deficiency of oxygen, increase of carbonic acid, and organic matter. Now we believe that the real causes are increased temperature and humidity, and stagnation of the confined air, just how these factors act, we do not know, but experience has demonstrated that when the air is kept in motion, and the temperature reduced, the unpleasant symptoms do not occur.

The inflow of fresh air to take the place of that which has been breathed is known as *ventilation.*

The heat which is produced in the body by the burning or oxidation of carbon, the resulting carbonic acid escaping through the lungs, would raise the temperature of the body too high were it not that provision is made for its regulation. The evaporation of water is the principal cooling agency, the evaporation taking place from the lungs and skin; this is going on all the time, though the vapor from the lungs is only visible in cold weather. So with the skin, the water is only visible in hot weather, when so much escapes that the unevaporated portion becomes visible as *sweat* or *perspiration;* the harder we work, the more heat is produced, and the more evaporation of water is required to reduce the body temperature. If the skin stops functioning the body temperature rapidly rises, and we have the condition of *heat stroke,* in which the hot, dry skin is a familiar symptom.

Urinary Apparatus. We have already seen that in all life processes waste products and poisons are produced, which, if not gotten rid of, are finally fatal even to the life which produced them. The yeast fungus growing in sugar solution produces a poison, alcohol, which when it reaches a certain proportion destroys the life of the yeast; so with the human body, it produces very deadly poisons which must be thrown off if the body would live, and the apparatus by which these poisons are eliminated is known as the excretory apparatus. The skin, lungs, large intestine, and urinary apparatus all take part in excretion.

The excretory functions of the skin, lungs, and rectum have been fully described elsewhere. It remains to give a description of the *urinary* *apparatus,* whose practically sole function is excretion. It consists of the *kidneys,* which secrete the urine, and the *ureters,* which convey it to the *bladder,* where it accumulates until it is convenient to discharge it through the *urethra.*

The *kidneys* (Fig. 65), one on each side, are situated in the loins, at the back of the abdomen, behind the peritoneum, on either side of the spinal column, and just below the last rib. They are about four inches long by two and a half inches wide, by one and an eighth inches thick, and weigh about five ounces each. They consist of two portions, a cortex and medullary portion, and are covered by a fibrous capsule which may be stripped off. The *cortex* is the secreting part, while the *medulla* is largely an aggregation of urinary tubules on their way to the pelvis of the kidney.

Each *urinary tubule,* after many twists and loops, terminates in a little sack, in which is a bunch or tuft of tortuous capillaries; the veins emerging from these capillaries are smaller than the arteries that empty into them, so that the blood in passing through is subjected to some degree of pressure, and under the pressure water and salts escape from the vessels. Farther on down the tubule the secreting epithelium with which the tubule is lined takes from the blood the urea and other waste products necessary to purify it and complete the urine.

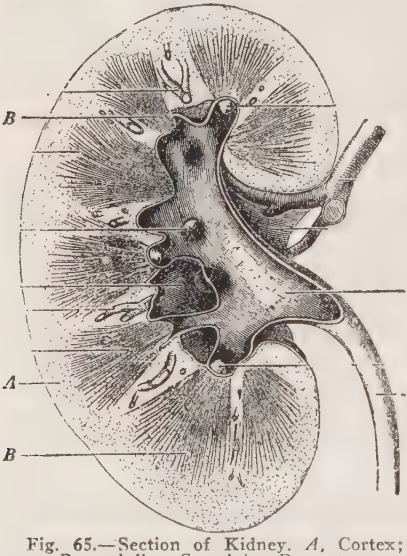


Fig. 65.—Section of Kidney. *A,* Cortex; *B,* medulla; *C,* pelvis; *D,* ureter.

On the inner side of each kidney is a deep depression containing a funnel-shaped sac, the *pelvis,* which receives the terminations of the urinary tubules, and is itself the starting point of the ureters. The *ureters* are two musculo-membranous tubes, about the size of a goose quill, and sixteen inches long, extending from the pelvis of the kidneys to the urinary bladder (Fig. 65).

When a stone formed in the pelvis of the kidney finds its way into one of these ureters, in its passage to the bladder, it naturally has a hard time in getting through such a small canal, and the result is the excruciating pain experienced in such a condition, which is known as *renal colic.*

The *bladder* is a muscular bag which serves as a reservoir for the urine and in a moderately distended condition holds about a pint. When empty or containing only a small amount of urine it lies wholly within the pelvis, and behind the pubis; when full it rises into the abdomen and can be felt and percussed above the pubis. To determine whether the bladder is full we tap on the finger placed just above the pubis; if we get a hollow sound we know that it cannot be distended (Fig. 66).

As the bladder rises into the abdomen it leaves exposed in front a small area not covered by the peritoneum and through which it can be aspirated without opening the peritoneum. Likewise there is a similar area behind, where the bladder rests on the rectum and through which it can be reached. The neck of the bladder is embraced by the *prostate gland* which in old men becomes enlarged and makes a bar to the passage of urine.

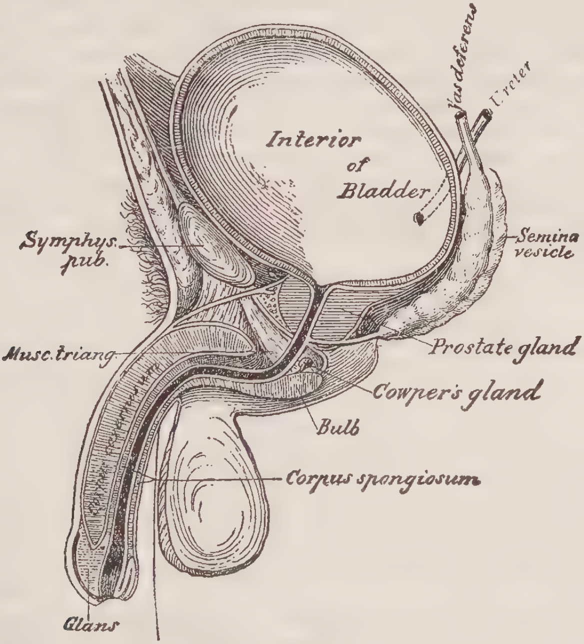


Fig. 66.—Section of Bladder and Urethra.

The *urethra* is eight or nine inches long and extends from the neck of the bladder to the *meatus*: when the penis is held up that portion of the urethra under the pubis describes a curve with the concavity upward, hence the curved shape of catheters and sounds.

Urine is a watery solution of urea, uric acid, coloring matter, and salts, mostly urates, phosphates, carbonates, and chlorides. The average man passes about fifteen hundred cubic centimeters or three pints of urine a day, and this urine contains about fifty grammes, or one and one-half ounces of solids. Normal urine is yellowish in color, acid in reaction, and has a specific gravity of from 1015 to 1025.

The *urea* is the most important constituent, a little more than an ounce being excreted daily.

Healthy urine when passed is ordinarily clear, but it may quickly become cloudy and a sediment form without indicating disease. If such cloudiness disappears when the urine is heated it is due to *urates;* if the cloudiness disappears on the addition of a few drops of acid it is due to *phosphates.*

Among abnormal constituents of the urine, indicating disease, are albumin, sugar, bile, blood, and pus.

Just above the kidney on each side is a small triangular ductless gland known as the *suprarenal gland.* It has nothing to do with the excretion of urine but is considered here for convenience. That these little glands add something important to the blood is shown by the fact that their removal in animals is quickly followed by death, and that their diseased condition in man is the cause of a fatal malady known as *Addison's disease.* Their function appears to be to sustain muscular tone, especially in the blood-vessels, and a substance known as *epinephrine* or *adrenaline* has been isolated from them which has a very powerful effect in that direction. If epinephrine is applied to small bleeding vessels the flow will cease, due to the constriction produced by this substance.

CHAPTER XII

MATERIA MEDICA AND PHARMACY

Introduction. The fact that an enlisted specialist—pharmacist—is available for compounding and dispensing medicines does not relieve senior noncommissioned officers of the responsibility of acquiring a working knowledge of this subject, and exercising general supervision over the Pharmacy. Moreover, all medical soldiers whose daily duties require them to handle and administer medicines should learn something of their outstanding features. Whenever a remedy with which you are not familiar is ordered by a medical officer cultivate the habit of "looking it up" in this chapter.

Definitions: *Materia medica* treats of the materials or drugs used in medicine; their origin, composition, physical and chemical properties, and their action.

Therapeutics is the art of applying the articles of the materia medica to the cure of disease.

Pharmacy is the art of preparing drugs and dispensing them.

Official Pharmacy deals with the processes and preparations of the Pharmacopœia.

Extemporaneous Pharmacy describes the methods of preparing and dispensing physicians' prescriptions.

A *Pharmacopœia* is an *official* list of drugs and their preparations recognized by the medical profession of a certain country; such drugs and methods are known as *official.*

A *Dispensatory* is a private treatise on official and other drugs.

The *National Formulary* is a book containing numerous useful formulas not found in the Pharmacopœia, but which have been officially recognized by Congress.

Pharmacopeial Changes. The medicinal agents described herein conform to the nomenclature, dosage, etc., given in the *Tenth Decennial Revision of the U. S. Pharmacopœia* (U.S.P.X) which became official on January 1st, 1926. Compared with U.S.P. IX, this last revision contains many new features and changes.

As regards *Posology* only *average doses* are given. Under this heading are cited the doses which may be expected ordinarily to produce the therapeutic effect for which the preparation is most commonly used. It is not intended to have these average doses regarded as obligatory on the physician, or as forbidding him to exceed the doses given, whenever, in his judgment, this may seem advisable.

About 40 new articles have been added to U. S. P. X, among which may be mentioned *Arsphenamine* and *Barbital.*

Nearly 200 articles previously official have been omitted; notably *Arnica, Cerii Oxalis,* and *Linimentum Ammoniae.*

Among changes in official Latin titles appear *Methenamina* in lieu of *Hexamethylenamina; Pilulae Hydrargyri Chloridi Mitis Compositae* in lieu of *Pilulae Catharticae Compositae; Sucrosum* in lieu of *Saccharum; Spiritus Aethylis Nitritis* in lieu of *Spiritus Aetheris Nitrosi.*

Changes in official English titles are comparatively few. *Aloes* becomes *Aloe. Lime* is substituted for *Calcium Oxide. Spirit of Ethyl Nitrite* is used in lieu of *Spirit of Nitrous Ether.*

The adoption in the U.S.P.IX of the designation "*mil*" as the more correct of the designations of the one-thousandth part of the liter did not in practice prove to be satisfactory. Accordingly U.S.P.X. returns to the almost universally used term "cubic centimeter" (*cc*). It is to be understood, however, that the cubic centimeter of the Pharmacopoeia represents the one-thousandth part of a liter.

Derivation of Drugs. Drugs or medicines are derived from the animal, vegetable, and mineral kingdoms.

The *active principles* of drugs are those constituents which are active in producing the effects of the drug; morphine, for example, is the active principle of opium.

Among active principles are *alkaloids* and *neutral principles.*

Alkaloids are usually very insoluble in water, but combine with acids to form soluble salts; they have powerful medicinal effects; their Latin names end in *ina* and their English names in *ine;* morphine, atropine, and quinine are some of the alkaloids of the supply table.

Neutral principles are neutral in character; they are distinguished by having their Latin names ending in *inum* and English names ending in *in.* Among neutral principles of the supply table is santonin.

Organic acids are found in organic substances. Examples: acetic acid, citric acid.

Mineral acids are obtained from the mineral kingdom. Examples: sulphuric acid, hydrochloric acid. They neutralize alkalies and when concentrated act as caustics.

Alkalies or *antacids* neutralize *acids* and in some forms act as caustics. Examples: bicarbonate of soda, potassa.

Fixed oils are non-volatile, and are decomposed by boiling with water and an alkali, the resulting products being soap and glycerin. Examples: olive oil, castor oil.

Volatile or *essential oils* exist in plants from which they are extracted by distillation with water; they evaporate when exposed to the air and have penetrating aromatic odors. Examples: oil of cloves, oil of peppermint.

Classification of Remedies. Medicines are sometimes classified according to their most noticeable effects, thus:

Alteratives are remedies whose action may be beneficial, especially in chronic diseases, by favorably altering deranged functions. Examples: arsenic, iodides.

Anodynes or *analgesics* are remedies which relieve pain. Examples: opium, acetphenetidin.

Anesthetics are agents which temporarily destroy sensation; they are subdivided into *General Anesthetics* and *Local Anesthetics.*

General anesthetics are volatile substances which, when inhaled, destroy consciousness and sensation. Examples: ether, chloroform.

Local anesthetics act directly upon the nerves of the part with which they are brought in contact, destroying sensation temporarily. Examples: cocaine, phenol.

Anthelmintics are agents used to expel worms from the intestines. Examples: santonin, thymol.

Antidotes are remedies against poisons; thus the alkaline sulphates are antidotes for phenol.

Antipyretics are agents which reduce fever. Examples: quinine, antipyrin.

Antiperiodics are remedies which oppose the periodic return of symptoms. Examples: quinine, arsenic.

Antiseptics are substances which prevent or retard septic decomposition by destroying or arresting the development of the bacteria of sepsis. Examples: Alcohol, phenol (*Germicide* and *Disinfectant* are almost synonymous terms and signify that the agents used are strong enough to destroy micro-organisms.)

Astringents, of which alum is an example, are substances which cause a constriction of the tissues and lessen discharges.

Carminatives are agents which cause the expulsion of gas from the stomach and intestines; the essential oils are carminatives.

Cathartics, purgatives, and laxatives are medicines which increase the action of the bowels. Laxatives have a mild action; example: cascara sagrada. Purgatives are more powerful; example: castor oil. Drastics have a violent action; example: croton oil. Hydragogue cathartics produce copious watery stools; example: epsom salt.

Diaphoretics are agents which increase the secretion of sweat. Dover's powder is a diaphoretic.

Disinfectants are substances which destroy the specific germs which infect people with disease. Phenol and corrosive sublimate are disinfectants.

Diuretics increase the flow of urine. Example: sweet spirit of nitre.

Emetics cause vomiting. Ipecac and apomorphine are emetics.

Expectorants are agents which promote the secretion and expulsion of mucus from the bronchi. Ammonium chloride is an expectorant.

Hypnotics produce sleep. Barbital and chloral are hypnotics.

Narcotics are agents which produce stupor. Example: opium.

Sedatives are agents which allay excitement, irritation, or pain. They may have general or local effect and include anodynes, narcotics, and anesthetics.

Styptics are substances which arrest bleeding when locally applied. Alum is a styptic.

Certain drugs affect the skin, urine, or feces in a way that should be known to those charged with their administration:

Drugs which may produce an eruption on the skin: Arsenic, acetanilid, antipyrin, belladonna, bromides, chloral, copaiba, iodides, opium, acetphenetidin, quinine, salicylic acid, turpentine.

Drugs which color the feces: Iron—black; bismuth—slate color or black; calomel—green.

Drugs which color the urine: Phenol—dark green; rhubarb—yellow; santonin—saffron color if the urine is acid, purplish-red if alkaline.

Drugs which have a tendency to become liquid on exposure to air by the absorption of moisture, are said to be *deliquescent* or *hygroscopic,* while those which lose their water of crystallization and become dry and powdery are called *efflorescent.*

Administration of Medicines. Medicines are given by the mouth and stomach, by the rectum, by the skin, blood-vessels, and subcutaneous cellular tissues.

By the mouth and stomach is the method ordinarily employed. Medicines which are irritating to the stomach should be given well diluted and after meals.

The rectum is sometimes employed for the administration of medicines when the stomach will not retain them.

Remedies are injected into the veins direct only in case of great emergency. An exception to this rule are certain remedies used in the treatment of syphilis and normally administered intravenously.

The administration of drugs by the subcutaneous cellular tissue is called the *hypodermic method;* it is employed when prompt action is desired. Alkaloids like morphine and strychnine are especially suitable for this method, and large quantities of normal salt solution are frequently so employed.

Substances are also introduced into the circulation by simply rubbing them into the unbroken skin. Fats and oils and remedies incorporated with them are often used in this way. Syphilis is frequently treated by inunctions of mercurial ointment.

Ether and chloroform are given by *inhalation.* Steam may also be impregnated with certain drugs and inhaled.

Principles of Dosage. Doses are only relative and cannot be represented in exact figures, since they are subject to so many influencing circumstances. The principal of these are age, size and weight, habit, idiosyncrasy, interval between doses, time of administration, condition of stomach or (if externally applied) of skin, disease, climate, method of administration, form of drug used, etc.

Dosage in Children: Doses ordinarily given are those for adults; to compute the suitable quantity for a child, either of the following rules may be made use of:

(1) Young's method: Divide the age by the age + 12; thus, suppose the child is 3 years old $\frac{3}{3+12} = \frac{3}{15} = \frac{1}{5}$: hence we give one-fifth of the adult dose.

(2) Cowling's method: Divide the number of the following birthday by 24; thus, child's age is 3, next birthday is $\frac{4}{24} = \frac{1}{6}$: hence dose is one-sixth that of adult (this gives a slightly smaller dose than does Young's rule).

Children bear *opium* badly, and hence the dose should be proportionately small. Comparatively *large doses* of belladonna, aconite, mercury, arsenic, quinine, and cathartics in general are borne by children.

When given *hypodermically,* the dose of medicines is *two-thirds* of that used by mouth. When given by rectum, it is *four-thirds* of the dose by mouth.

List of Medicines and Medicinal Agents. Below are listed alphabetically, some of the medicines and medicinal agents used in Army Pharmacies. The official Latin title is given first and followed in parenthesis by the English name or synonym. The dose indicated is the *average dose* of the U. S. P.

Acacia (Gum Arabic). A gummy exudation from Acacia Senegal and other species of Acacia. A glassy-looking substance in fragments; soluble in water, used as a vehicle. The powder is white.

Mucilago Acaciae (acacia 340; lime water 330; water to 1,000).

Acetanilidum (Acetanilid). A derivative of aniline. A colorless crystalline powder, odorless, with a slightly burning taste, soluble in 179 parts of water. Used in neuralgia. Dose: 0.25 Gm.

Acetphenetidinum (Acetphenetidin, Phenacetin). A phenol derivative. White scales or crystalline powder, odorless and tasteless. Soluable in 925 parts of water or 12 parts of alcohol. Antipyretic and antineuralgic. Dose: 0.75 Gm.

Acidum Aceticum (Acetic Acid). A clear, colorless liquid, having a strong vinegar-like odor and an acid taste.

Acidum Aceticum Dilutum (Acetic acid 100; water 500). Dose: 2 cc.

Acidum Acetylsalicylicum (Acetylsalicylic Acid, Aspirin). A salicylic acid compound. Occurs in white crystalline needles of agreeable taste. Soluble in 300 parts of water and 5 parts of alcohol. Antineuralgic and antirheumatic. Dose: 0.3 Gm.

Acidum Boricum (Boric Acid). Colorless scales, or a light, white powder; odorless and slightly bitter, soluble in 18 parts of water and alcohol. Used as a mild antiseptic. Dose: 0.5 Gm.

Acidum Citricum (Citric Acid). Usually prepared from lime or lemon juice. Colorless, odorless, acid-tasting crystals; efflorescent in dry air and deliquescent in moist air. Very soluble in water. Dose: 0.5 Gm.

Acidum Hydrochloricum (Hydrochloric Acid). A colorless fuming liquid which should be kept in glass-stoppered bottles.

Acidum Hydrochloricum Dilutum (Hydrochloric acid 100, water 219). Dose: 1 cc.

Acidum Nitricum (Nitric Acid). A colorless fuming liquid; very caustic; should be kept in glass-stoppered bottles.

Acidum Nitricum Dilutum (Nitric acid 100, water 580). Dose: 2 cc.

Acidum Oxalicum (Oxalic Acid). Colorless crystals, very poisonous. Used externally only. Fatal results have followed mistaking this substance for sulphate of magnesia, which it resembles. The two may be distinguished by heating a few of the crystals to a red heat on the end of a spatula; oxalic acid will be completely dissipated, while sulphate of magnesia will not. Another distinction lies in the fact that oxalic acid decolorizes solution of permanganate of potash, while sulphate of magnesia does not.

Acidum Phosphoricum Dilutum (Dilute Phosphoric Acid). A colorless, odorless liquid, which should be kept in glass-stoppered bottles. (Phosphoric acid 100, water 750). Tonic and refrigerant. Dose: 2 cc.

Acidum Salicylicum (Salicylic Acid). An organic acid existing naturally in some plants, but generally prepared from phenol. Light, fine white needles, or a crystalline powder, with a faint odor and a sweetish taste. Soluble in 460 parts of water and 2.7 parts of alcohol. Antipyretic and antirheumatic. Dose: 0.5 Gm.

Acidum Sulphuricum (Sulphuric Acid). A colorless, oily, very corrosive liquid. Should be kept in glass-stoppered bottles.

Acidum Sulphuricum Aromaticum (Aromatic Sulphuric Acid). (Sulphuric acid 111, tincture of ginger 50, oil of cinnamon 1, alcohol to 1,000). Used in the night-sweats of tuberculosis. Astringent. Hemostatic. Dose: 1 cc.

Acidum Tannicum (Tannic Acid). An organic acid obtained from nutgalls. A light yellow powder with a faint odor, and strongly astringent taste. Soluble in about 0.34 part of water. Used as an astringent. Dose: 0.5 Gm.

Acidum Tartarticum (Tartaric Acid). An organic acid occurring in colorless crystals or a white powder; odorless and with an acid taste. Soluble in 0.71 part of water. Used chiefly in the preparation of effervescing, refrigerant drinks and effervescent granulated salts. Dose: 0.5 Gm.

Aconiti Tinctura (Tincture of Aconite). 10 per cent strength. Used to quiet the heart. Dose: 0.6 cc.

Adeps Lanae Hydrosus (Wool Fat, Lanolin). The purified fat of the wool of sheep, freed from water. A light-yellowish, tenacious, unctuous mass; insoluble in, but miscible with, large quantities of water. Used as a basis for ointments.

Æther (Ether). A transparent, colorless liquid, having a characteristic odor and a burning sweetish taste. Its vapor, when mixed with air and ignited, explodes violently. Used chiefly as an anesthetic, by inhalation. Dose: Internally, 1 cc.

Æthylis Spiritus Nitritis (Spirit of Ethyl Nitrite, Sweet Spirit of Nitre). A clear, volatile liquid of a pale yellowish tint, fragrant odor and burning taste. Used as a diuretic and carminative. Dose: 2 cc.

Æthylis Chloridum (Ethyl Chloride). An extremely volatile liquid kept in hermetically sealed tubes. Used chiefly in the form of a spray as a local anesthetic by virtue of its freezing properties. Also sometimes used as a general anesthetic, by inhalation.

Alcohol, Ethyl (Alcohol). A colorless, volatile liquid containing about 95 per cent by volume of absolute alcohol. It is obtained by the distillation of grain.

Alcohol, Methyl (Wood Alcohol). A colorless, poisonous liquid of a disagreeable odor obtained in the destructive distillation of wood. It is used frequently as an adulterant of cheap liquors, in toilet preparations, and as a fuel, and when taken internally has caused many deaths.

Aloe Pulvis (Powdered Aloe). A brownish-yellow powder of bitter taste, used as a laxative. Dose: 0.25 Gm.

Aloini Pilulae Compositae (Compound Aloin Pills). Contain 8 mgm. each of aloin, podophyllum resin, and extract of belladonna, 0.8 mgm. of strychnine, and 2.7 mgm. of oleoresin of capsicum. Laxative. Dose: 1-2 pills.

Alumen (Alum) The powder is white, with a sweet, astringent taste. There are two alums, both official and having the same properties and uses. They are Ammonium alum and Potassium alum. Ammonium alum is soluble in 5.2 parts of water and Potassium alum in 7.2 parts of water. Used as an emetic and as an astringent. Dose: 0.5 Gm.

Ammoniae Aqua Fortior (Stronger Ammonia Water). An aqueous solution containing 28% of ammonia gas. Deteriorates rapidly; should be kept in glass-stoppered bottles. Great care should be used in handling this liquid because of its caustic and irritating properties. Used in the preparation of ammonia water.

Ammoniae Aqua (Ammonia Water). A 10 percent aqueous solution of ammonia gas. Commonly made by diluting stronger ammonia water. A powerful stimulant. Dose: 1 cc. well diluted.

Ammoniae Spiritus Aromaticus (Aromatic Spirit of Ammonia). (Ammonium carbonate 34, ammonia water 90, alcohol 700, aromatics q. s., water to 1000). A yellowish liquid used as a stimulant and antacid. Dose: 2 cc, well diluted.

Ammonii Bromidum (Ammonium Bromide). Colorless crystals or a white crystalline powder, odorless and of a saline taste; soluble in 1.2 parts of water. Used as a sedative. It is irritating to the stomach and should be administered in plenty of water. Dose: 1 Gm.

Ammonii Carbonas (Ammonium Carbonate). White, translucent or opaque masses, having a strong odor of ammonia. Only the translucent portion should be dispensed. Used as a stimulant. Dose: 0.25 Gm.

Ammonii Chloridum (Ammonium Chloride). A white, odorless powder, with a cooling taste. Used as an expectorant. Dose: 0.5 Gm.

Ammonii Chloridi Trochisci (Ammonium Chloride Troches). Each contains 130 mgm. ammonium chloride and 0.5 gm. extract of licorice. Dose: 1 Troche.

Amylis Nitris (Amyl Nitrite) A clear, yellow liquid of a peculiar, penetrating odor. A powerful stimulant; used by inhalation only. Dose: 0.2 cc.

Amylum (Starch, Corn Starch). Starch consists of the granules separated from the grain of corn. A fine white powder or irregular, angular white masses. It is insoluble in cold water and alcohol. Used in medicines chiefly because of its filling or absorbent properties. It is used externally as an absorbent and is applied to the skin by dusting.

Antimonii et Potassii Tartras (Tartar Emetic). Colorless crystals, or a white granular powder; odorless and sweetish taste. Soluble in 15.5 parts of water. Dose: as an expectorant 0.005 Gm; as emetic 0.030 Gm.

Antipyrina (Antipyrine). A colorless, almost odorless, crystalline powder obtained from coal tar, having a bitter taste; soluble in less than 1 part of water. Dose: 0.3 Gm.

Apomorphinae Hydrochloridum (Apomorphine Hydrochloride). The salt of an alkaloid derived from opium. White crystals acquiring a greenish tint after exposure to light. Used hypodermically as an emetic, and by mouth as an expectorant. Dose: as an emetic 0.005 Gm. hypodermically; as an expectorant 0.001 Gm.

Argenti Nitras (Silver Nitrate) Colorless crystals, soluble in 0.54 part of water. Decomposed by light. Used externally as a caustic and escharotic; internally it is given in gastritis and diarrhoea. Dose: 0.01 Gm.

Argenti Nitras Fusus (Lunar Caustic) White or gray pencils. Used externally as an escharotic.

Argento-Proteinum Forte (Strong Silver-Protein, Strong Protargin). A compound of silver and protein, containing about 8% of silver. A brown, odorless powder, freely soluble in water; almost insoluble in alcohol. Solution of ¼ to 2 per cent is commonly used as an antiseptic and astringent application for affections of mucous membranes. Solutions should be freshly prepared and dispensed in amber-colored bottles.

Argento-Proteinum Mite (Mild Silver-Protein, Argyrol). Silver rendered colloidal by the presence of, or combination with, protein. It contains between 19 and 25 percent of silver. It occurs as dark-brown or black, shining scales or granules. It is freely soluble in water and is used in solutions of from 10 to 50 percent in the treatment of inflammation of mucous membranes. Solutions should be freshly prepared and dispensed in amber-colored bottles.

Arseni Trioxidum (White Arsenic). An opaque, white, poisonous powder; odorless and tasteless. Soluble in about 100 parts of water. Alterative. Dose: 0.002 Gm.

Arsphenamina (Arsphenamine). Arsphenamine contains not less than 30 percent of arsenic. It is a light, yellow, odorless powder. It is soluble in water, alcohol and glycerine. Arsphenamine is administered intravenously in the treatment of syphilis. Dose: 0.4 Gm.

Asafoetida (Asafetida). A gum-resin from the root of Ferula foetida and other species of Ferula. Yellowish-white masses. Antispasmodic. Dose: 0.4 Gm.

Aspidii Oleoresina (Oleoresin of Aspidium, Male Fern). A thick, dark-green liquid, depositing a granular substance on standing; this granular part should be well mixed with the liquid portion before dispensing. Used especially against tape-worms. Dose: 4 Gm. not oftener than once daily.

Atropinae Sulphas (Atropine Sulphate). The sulphate of an alkaloid obtained from Atropa belladonna and other plants of the same family. A white, odorless, bitter powder; very poisonous. Used to dilate the pupils and as a respiratory stimulant. Dose: 0.0005 Gm.

Balsamum Peruvianum (Balsam of Peru). A viscid, dark-brown liquid, of agreeable odor. Used as a wound dressing.

Barbitalum (Barbital). Colorless or white crystals, or white crystalline powder. It is odorless and has a slightly bitter taste. Soluble in 130 parts of water and 14 parts of alcohol. It is a hypnotic. Dose: 0.5 Gm.

Belladonnae Emplastrum (Belladonna Plaster).

Belladonnae Extractum (Extract of Belladonna). Used chiefly in the preparation of Belladonna Ointment. Dose: 0.015 Gm.

Belladonnae Tinctura (Tincture of Belladonna). Antispasmodic. Dose: 0.6 cc.

Benzoini Tinctura Composita (Compound Tincture of Benzoin). Used chiefly by inhalation with the vapor of hot water. Dose: 2 cc.

Bismuthi Subcarbonas (Bismuth Subcarbonate). A white or pale yellowish white powder, odorless and tasteless. Insoluble in water and alcohol. Used as an astringent and tonic. Colors the stools black. Dose: 1 Gm.

Bismuthi Subnitras (Bismuth Subnitrate). A white powder, odorless, tasteless, and insoluble in water. Used in diarrheal diseases. Colors the stools black. Dose: 1 Gm.

Caffeinae Sodio-Benzoas (Caffeine Sodio-Benzoate). A mixture of caffeine and sodium benzoate. A white odorless powder having a slightly bitter taste. Soluble in one part of water and in 30 parts of alcohol. Used as a diuretic and heart stimulant. On account of its greater solubility in water, this preparation of caffeine is especially adapted for hypodermic use. Dose: By mouth: 0.3 Gm.; Hypodermic: 0.2 Gm.

Calcii Carbonas Praecipitatus (Precipitated Calcium Carbonate, Precipitated Chalk). A fine white, microcrystalline powder without odor or taste. Almost insoluble in water, insoluble in alcohol. Used as an antacid. Dose: 1 Gm.

Calx (Lime). Used in the preparation of lime water.

Camphora (Camphor) White masses, sparingly soluble in water, but readily soluble in alcohol and in oils. Principally used externally, but is also a good heart stimulant and antispasmodic. Dose: 0.2 Gm.

Cantharis (Cantharides, Spanish Flies). Powdered cantharides is grayish-brown, with shining green particles. Used in preparation of Cantharides plaster and Tincture of Cantharides.

Cantharidis Emplastrum (Cantharides Plaster, Blistering Plaster).

Capsicum (Powdered Capsicum, Red Pepper). Used in the preparation of Tincture of Capsicum. Dose: 0.065 Gm.

Cardamomi Tinctura Composita (Compound Tincture of Cardamom). Used chiefly as a bitter tonic. Dose: 4 cc.

Cascarae Sagradae Extractum (Extract of Cascara Sagrada). Laxative and tonic. Dose: 0.3 Gm.

Cascarae Sagradae Fluidextractum Aromaticum (Aromatic Fluid Extract of Cascara Sagrada). A palatable preparation of the fluid extract. Laxative and tonic. Dose: 2 cc.

Cera Alba (White Wax, Bleached Beeswax). Used in pharmacy principally to give consistency to ointments.

Chloralis Hydras (Chloral Hydrate, Chloral). Colorless, transparent crystals, with an aromatic odor and bitterish taste. Freely soluble in water and alcohol. Used as a hypnotic. Dose: 0.5 Gm.

Chloroformum (Chloroform). A clear, colorless liquid of characteristic odor and sweetish, burning taste. Should be kept in amber-colored glass-stoppered bottles in a cool, dark place. Used chiefly as an anesthetic by inhalation. Dose: 0.3 cc.

Chromii Trioxidum (Chromium Trioxide). Needle-shaped crystals of purplish-red color; corrosive, deliquescent, very soluble in water. Should be kept in glass-stoppered bottles and great care taken not to bring it in contact with organic substances such as cork, sugar, alcohol, etc., as an explosion may result. Used solely as a caustic in crystals or solution.

Chrysarobinum (Chrysarobin). A neutral principal extracted from Goa powder. An orange-yellow, crystalline powder, odorless, tasteless, and very insoluble. Used externally, chiefly in ointments.

Cinchophenum (Cinchophen). Small colorless, needle-like crystals, or white to yellowish white powder. Almost insoluble in water. Antirheumatic. Dose: 0.5 Gm.

Cocainae Hydrochloridum (Cocaine Hydrochloride). A salt of an alkaloid obtained from several species of Coca. A colorless, odorless, crystalline powder; soluble in 0.4 part of water. Used chiefly as a local anesthetic. Dose: 0.015 Gm.

Codeinae Sulphas (Codeine Sulphate). A salt of an alkaloid from opium. A crystalline powder, odorless, with a faintly bitter taste. Used as a sedative. Dose: 0.03 Gm.

Colchici Fluidextractum (Fluid Extract of Colchicum). Used chiefly in gout. Dose: 0.2 cc.

Collodium (Collodion). A colorless, syrupy liquid, with the odor of ether. Used only externally.

Creosotum (Creosote). A mixture of phenols and phenol derivatives obtained by the distillation of wood tar, preferably from the beech. A yellowish, oily liquid having a penetrating, smoky odor and a burning taste.

Used principally in phthisis, also used in other diseases externally, by inhalation (steam) and by mouth. Dose: 0.25 cc.

Cresol (Cresol, Tricresol). A mixture of three cresols obtained from coal tar. A straw-colored liquid, having a phenol-like odor. Soluble in 60 parts of water. Used externally as a disinfectant. Dose: 0.06 cc.

Cresolis Liquor Compositus (Compound Solution of Cresol). A 50 percent solution of cresol with 35 percent linseed oil and 8 percent caustic potash in water. Used externally as a disinfectant.

Creta Praeparata (Prepared Chalk). A white powder; odorless, tasteless, insoluble, permanent. Used as an antacid and in the treatment of diarrhoea. Dose: 1 Gm.

Cupri Sulphas (Copper Sulphate) Deep-blue crystals, odorless, efflorescent, soluble in 2.2 parts of water. Used externally as an astringent, and internally as an emetic. Dose: As an emetic: 0.25 Gm.

Dextrosum (Dextrose, Glucose). A sugar usually obtained by the hydrolysis of starch. A white, crystalline powder or white granules. It is odorless and has a sweet taste. Used to replace glycerin in many preparations.

Digitalis (Powdered Digitalis, Foxglove). A dark green powder. Used in preparing the Infusion of Digitalis and the Tincture of Digitalis. Dose: 0.1 Gm.

Digitalis Tinctura (Tincture of Digitalis). Used as a heart tonic. Dose: 1 cc.

Emetinae Hydrochloridum (Emetine Hydrochloride). A white or very slightly yellowish, odorless, crystalline powder. It is freely soluble in water and alcohol. Used in the treatment of amoebic dysentery and pyorrhoea alveolaris. Usually administered hypodermically. Dose: 0.02 Gm.

Ergotae Fluidextractum (Fluid Extract of Ergot). Used chiefly to control bleeding. Dose: 2 cc.

Epinephrina (Epinephrine). A white or light brownish, microcrystalline, odorless powder, gradually darkening on exposure to the air. Very slightly soluble in water and in alcohol. Used in the treatment of hay-fever and bronchial asthma and applied locally to arrest bleeding. Dose: Hypodermic: 0.0005 Gm.

Epinephrinae Hydrochloridi Liquor (Solution of Epinephrine Hydrochloride). A nearly colorless, slightly acid liquid, gradually turning dark on exposure to air and light. Heart stimulant. Hemostatic. Increases arterial tension. Dose: Hypodermic: 0.5 cc.

Eucalyptol (Eucalyptol). An oxide from the oil of eucalyptus. A colorless liquid of aromatic odor and pungent taste. Antiseptic. Dose: 0.3 cc.

Eugenol (Eugenol). A phenol obtained from clove. A colorless or pale-yellow, thin liquid, having a strongly aromatic odor of clove, and a pungent, spicy taste. Used as an antiseptic and local anesthetic in dentistry. Dose: 0.1 cc.

Ferri Chloridum (Ferric Chloride). Orange-yellow or brown-yellow crystalline pieces. It is odorless and has a strong styptic taste. Very soluble in water and alcohol. Used externally as a styptic and internally as an iron tonic. Dose: 0.06 Gm.

Ferri Chloridi Tinctura (Tincture of Ferric Chloride, Tincture of Iron). A bright, brownish liquid, having an astringent, styptic taste. Injures the teeth; should be taken through a glass tube and well diluted. Used as a tonic. Dose: 0.6 cc.

Ferri Iodidi Syrupus (Syrup of Ferrous Iodide). A syrupy, pale green liquid, having a sweet taste. Used as a tonic. Dose: 1 cc.

Ferri Phosphas Solubilis (Soluble Ferric Phosphate). Thin, apple-green, colorless scales; decomposed by light; soluble in water, insoluble in alcohol. Used as a tonic. Dose: 0.25 Gm.

Ferri Sulphas Exsiccatus (Dried Ferrous Sulphate). A grayish-white powder, slowly but completely soluble in water. Dose: 0.06 Gm.

Ferrum Reductum (Reduced Iron). A fine, grayish-black powder; odorless, tasteless, insoluble. Dose: 0.06 Gm.

* *Foot Powder.* Contains 3 parts salicylic acid, 10 of starch, and 87 parts of talcum.

Gentianae Tinctura Composita (Compound Tincture of Gentian). Used as a tonic. Dose: 4 cc.

Glycerinum (Glycerine). A liquid obtained by the decomposition of fats or fixed oils; clear, colorless, odorless, sweet. Emollient externally and good vehicle for other medicines internally. Dose: 4 cc.

Glycerylis Nitratis Spiritus (Spirit of Glyceryl Trinitrate, Spirit of Nitroglycerin). A clear, colorless liquid, having the odor of alcohol. Antispasmodic. Lowers arterial tension. Dose: 0.06 cc.

Glycyrrhizae Extractum (Extract of Glycyrrhiza, Extract of Licorice Root). A glossy, black mass, with a sweet taste. Used for flavoring.

Glycyrrhizae Pulvis Compositus (Compound Licorice Powder). Contains licorice, senna, sulphur, oil of fennel and sugar; about 0.75 Gm. of senna and 0.33 Gm. of sulphur in each 4 Gm. Used as a laxative. Dose: 4 Gm.

Homatropinae Hydrobromidum (Homatropine Hydrobromide). An artificial alkaloid derived from atropine. Used to dilate the pupil. Soluble in 6 parts of water. Extremely poisonous. Dose: 0.0005 Gm.

Hydrargyri Ammoniati Unguentum (Ammoniated Mercury Ointment, White Precipitate Ointment). (Ammoniated mercury 10%, Liquid Perolatum 10%, Hydrous Wool-Fat 40% and White Petrolatum 40%). Used in skin diseases, such as psoriasis, eczema and ringworm.

Hydrargyri Chloridum Corrosivum (Corrosive Mercuric Chloride. Corrosive Sublimate, Bichloride of Mercury). Heavy, colorless, odorless, rhombic crystals or a white powder. It is extremely poisonous. Soluble in 13 parts of water and about 4 parts of alchol. Used as an antiseptic and in syphilis. Dose: 0.004 Gm.

Hydrargyri Chloridum Mite (Mild Mercurous Chloride, Calomel). A white powder, odorless, insoluble, tasteless, permanent. Used as a laxative. Dose: Laxative: 0.15 Gm.

Hydrargyri Iodidum Rubrum (Red Mercuric Iodide, Mercuric Iodide). A scarlet-red amorphous powder, without odor. It is practically insoluble in water but is soluble in 115 parts of alchol. Used in the treatment of syphilis. It is is extremely poisonous. Dose: 0.004 Gm.

Hydrargyri Mite Unguentum (Mild Mercurial Ointment, Blue Ointment). A blue ointment. Used externally. Contains 30 percent of mercury.

Hydrargyri Oxidum Rubrum (Red Mercuric Oxide, Red Precipitate). Heavy, orange-red crystalline scales or powder, odorless and having a metallic taste. Has the same chemical composition as the yellow oxide.

Hydrargyri Oxidi Flavi Unguentum (Ointment of Yellow Mercuric Oxide). Used externally in treatment of inflamed eyelids and in skin diseases. The USP ointment contains one percent of yellow oxide of mercury.

Hydrargyri Salicylas (Salicylate of Mercury). An odorless, white, slightly yellowish or slightly pinkish powder. Used hypodermically, suspended in oil, as an antisyphilitic. Dose: Intramuscular 0.06 Gm.

Hydrargyrum (Mercury, Quicksilver). A shining, silver-white metal; liquid, at ordinary temperatures.

Hyoscyami Extractum (Extract of Hyoscyamus, Extract of Henbane). Used as a sedative. Dose 0.05 Gm.

Iodoformum (Iodoform). A yellow powder with a peculiar, penetrating odor. Very insoluble in water. Used externally as a mild antiseptic.

Iodum (Iodine) Bluish-black crystals. Very insoluble in water and soluble in 12.5 parts of alcohol. Used to make the tincture. Dose: 0.01 Gm.

Ipecacuanha (Powdered Ipecac). A yellowish powder. Used as an emetic and expectorant. Dose: As emetic: 1 Gm.; as expectorant: 0.06 Gm.

Ipecacuanhae et Opii Pulvis (Powder of Ipecac and Opium, Dover's Powder). (Powdered Ipecac 10 parts, Powdered Opium 10 parts and Sugar of Milk 80 parts). A yellowish-white powder. Used as a diaphoretic. Dose: 0.3 Gm.

Ipecacuanhae Fluidextractum (Fluid Extract of Ipecac). Used as an emetic and expectorant. Dose: As emetic: 1 cc. As expectorant: 0.06 cc.

Lactosum (Lactose. Milk Sugar). A white powder obtained from cow's milk.

Liquor Formaldehydi (Solution of Formaldehyde). A clear, colorless or nearly colorless liquid having a pungent odor. Its vapor irritates the mucous membrane of the throat and nose. Antiseptic, disinfectant and deodorant.

Liquor Hydrogenii Dioxidi (Solution of Hydrogen Dioxide, Solution of Hydrogen Peroxide). A colorless, odorless liquid, or having an odor suggesting ozone. Antiseptic and deodorant. Dose: 4 cc.

Lycopodium (Lycopodium). A very light, pale-yellow powder, used in pill boxes as a drying powder.

Magnesii Carbonas (Magnesium Carbonate). A white, insoluble, permanent powder. Antacid. Laxative. Dose: antacid 0.6 Gm.; laxative 8 Gm.

Magnesii Oxidum Ponderosum (Heavy Magnesium Oxide, Heavy Magnesia). A white, dense, odorless and very fine powder, practically insoluble in water and insoluble in alchol. Antacid and laxative. Dose: antacid 0.25 Gm.; laxative 3 Gm.

Magnesii Sulphas (Magnesium Sulphate, Epsom Salt). Small, colorless needles, odorless, efflorescent; soluble in 0.85 part of water. Used as a purgative. Dose: 15 Gm.

Menthol (Menthol). An alcohol obtained from oil of peppermint. Colorless crystals having an odor of peppermint. Only slightly soluble in water; freely soluble in alcohol. Used as an antiseptic and analgesic. Dose: 0.06 Gm.

Methenamina (Methenamine, Urotropin). Colorless, lustrous crystals or white, crystalline powder. Soluble in 1.5 parts of water and 12.5 parts of alcohol. Used as urinary disinfectant and in bronchial affections. Dose: 0.3 Gm.

Methylis Salicylas (Methyl Salicylate. Oil of Wintergreen, Synthetic). A colorless liquid having a wintergreen odor. Antirheumatic. Dose: 0.75 cc.

Methylthioninae Chloridum (Methylthionine Chloride, Methylene Blue). Odorless, dark-green crystals or crystalline powder, freely soluble in water and alcohol. Antiseptic to genito-urinary tract; antiperiodic. Dose: 0.15 Gm.

Morphinae Sulphas (Morphine Sulphate). The salt of an alkaloid obtained from opium. White, feathery crystals; odorless, permanent and bitter. Soluble in 15 parts of water. Sometimes mistaken for quinine, which it closely resembles, with fatal results. May be distinguished by the action of nitric acid, which with morphine gives an orange-red color fading to yellow, and with quinine does not give the color reaction. Used to relieve pain and produce sleep. Dose: 0.008 Gm.

Myrrhae Tinctura (Tincture of Myrrh). Used chiefly in mouth washes. Dose: 2 cc.

Neoarsphenamina (Neoarsphenamine). Contains not less than 19 percent of Arsenic. An odorless, yellow powder. It is very soluble in water, soluble in glycerine and slightly soluble in alcohol. Administered intravenously in the treatment of syphilis. Kept in sealed glass containers. Solutions must be freshly prepared. Dose: 0.6 Gm.

Nucis Vomicae Tinctura (Tincture of Nux Vomica). Used as a tonic. Dose: 1 cc.

Oleum Anisi (Oil of Anise). A colorless or pale yellow, strongly refractive, liquid, having the characteristic odor and taste of anise. Soluble in 3 parts of alcohol. Carminative. Dose: 0.1 cc.

Oleum Aurantii (Oil of Orange). A pale yellow liquid used as a flavoring agent. Should be kept in amber-colored bottles, in a cool place. Dose: 0.1 cc.

Oleum Cadinum (Oil of Cade). A dark-brown, clear, thick liquid having a tarry odor and a faint, aromatic, bitter taste. Very slightly soluble in water, partially soluble in alcohol. Used externally as an antiparasitic.

Oleum Chenopodii (Oil of Chenopodium, Oil of American Wormseed). A colorless or pale yellowish liquid, having a peculiar, disagreeable odor, and a bitter, burning taste. Soluble in 8 parts of 70 percent alcohol. Anthelmintic; vermifuge. Dose: 1 cc.

Oleum Cinnamomi (Oil of Cinnamon). A yellowish or brownish liquid, becoming darker and thicker by age or exposure to the air, and having the characteristic odor and taste of cassia cinnamon. Soluble in equal part of alcohol. Carminative. Dose: 0.1 cc.

Oleum Coriandri (Oil of Coriander). A colorless or pale yellow liquid. Soluble in 3 parts of 70 percent alcohol. Stimulant and carminative. Dose: 0.1 cc.

Oleum Gossypii Seminis (Cottonseed Oil). A yellow, oily liquid. Odorless or nearly odorless, and has a bland taste. It is a fixed oil, expressed from cottonseed. Frequently used in liniments.

Oleum Limonis (Oil of Lemon). A pale yellow or greenish-yellow liquid, obtained by expression from the fresh peel of the fruit. Soluble in 3 parts of alcohol. Used as a flavoring agent. Dose: 0.1 cc.

Oleum Lini (Linseed Oil). The fixed oil obtained from linseed. A yellow, oily liquid, having a peculiar odor, and a bland taste. Only slightly soluble in alcohol. For external use.

Oleum Menthae Piperitae (Oil of Peppermint). A volatile oil distilled from the leaves and flowers of peppermint. Used chiefly for flavoring. Dose: 0.1 cc.

Oleum Morrhuae (Cod Liver Oil). The fixed oil expressed from the fresh liver of codfish. Tonic, alterative and nutrient. Dose: 10 cc.

Oleum Olivae (Olive Oil). The fixed oil obtained from ripe olives. A pale yellow, or light greenish-yellow, oily liquid, having a slight, peculiar odor and taste, with a faintly acrid after-taste. Only slightly soluble in alcohol. Nutrient and laxative. Dose: 30 cc.

Oleum Ricini (Castor Oil). The fixed oil expressed from castor beans. Used as a purgative. Dose: 15 cc.

Oleum Santali (Oil of Santal). A volatile oil distilled from sandalwood. Genito-urinary stimulant and antiseptic. Dose: 0.5 cc.

Oleum Terebinthinae (Oil of Turpentine, Spirits of Turpentine). A volatile oil distilled from the oleoresin obtained from pine trees. A colorless liquid, having a characteristic odor and taste. Soluble in 5 parts of alcohol. Used externally in liniments as a stimulant and counter-irritant.

Oleum Theobromatis (Oil of Theobroma, Cacao Butter). A fixed oil expressed from the roasted cacao seeds. A yellowish white solid. Used chiefly as a basis for suppositories.

Opii Tinctura (Tincture of Opium, Laudanum). Analgesic and somnifacient. Dose: 0.6 cc.

Opii Tinctura Camphorata (Camphorated Tincture of Opium, Paregoric). Analgesic and carminative. Dose: 4 cc.

Opium Pulveratum (Powdered Opium). A brownish powder. Somnifacient, analgesic and antispasmodic. Dose: 0.06 Gm.

Paraffinum (Paraffin). A purified mixture of solid hydrocarbons, obtained from petroleum. A colorless or white, more or less translucent mass, frequently showing a crystalline structure, odorless and tasteless and slightly greasy to the touch. Used chiefly to give stiffness to ointments.

Paraldehydum (Paraldehyde). A colorless, transparent liquid. Hypnotic and sedative. Dose: 2 cc.

Petrolatum (Petroleum Jelly). A petroleum product. Used externally as a basis for ointments.

Petrolatum Liquidum (Liquid Paraffin, White Mineral Oil). A mixture of liquid hydrocarbons obtained from petroleum. A colorless, transparent, oily liquid, insoluble in water and alcohol. Light liquid petrolatum is used chiefly in sprays for the nose and throat. Heavy liquid petrolatum is used internally as a mechanical lubricant to the intestinal tract. Dose: 15 cc.

Phenol (Phenol, Carbolic Acid). Obtained by distillation from coal-tar or prepared synthetically. A white crystalline mass sometimes acquiring a reddish tint. Soluble in about 15 parts of water. It is very soluble in alcohol, glycerin, chloroform, ether and volatile oils. In poisonous doses it colors the urine dark green. Used chiefly as an antiseptic. Dose: 0.06 Gm.

Phenobarbitalum (Phenobarbital, Luminal). White, glistening, small crystals or a white crystalline powder. It is odorless. Soluble in 1000 parts of water and 8 parts of alcohol. Hypnotic. Dose: 0.03 Gm.

Phenolphthaleinum (Phenolphthalein). A coal tar derivative. White or grayish-white powder, soluble in 600 parts of water. Used as a mild laxative. Dose: 0.06 Gm.

Phenolsulphonphthaleinum (Phenolsulphonphthalein, Phenol Red). A crystalline powder varying in color from bright to dark red. Soluble in 1300 parts of water and 350 parts of alcohol. Used in kidney function tests. Dose: 0.006 Gm.

Phenylis Salicylas (Phenyl Salicylate, Salol). A white powder having a faint, aromatic odor and a characteristic taste. Soluble in 6 parts of alcohol, but barely soluble in water. Used as an intestinal antiseptic. Dose: 0.3 Gm.

Physostigminae Salicylas (Physostigmine Salicylate, Eserine Salicylate). A salicylate of an alkaloid obtained from the dried ripe seed of Physostigma or calabar bean. Myotic and spinal depressant. Dose: 0.002 Gm.

Pilocarpinae Hydrochloridum (Pilocarpine Hydrochloride). A salt of an alkaloid obtained from Pilocarpus or Jaborandi. Used as a diaphoretic. Dose: 0.005 Gm.

Pilulae Hydrargyri Chloridi Mitis Compositae (Compound Pills of Mild Mercurous Chloride, Compound Cathartic Pills). Contain calomel, colocynth, jalap and gamboge. Each pill contains 0.06 Gm. of calomel. Dose: 2 pills.

Plumbi Acetas (Lead Acetate, Sugar of Lead). Colorless crystals; efflorescent, soluble in 1.4 parts of water and in 38 parts of alcohol. Used as an astringent. Dose: 0.06 Gm.

Plumbi Monoxidum (Lead Monoxide, Litharge). A heavy, yellowish or reddish-yellow powder without odor or taste. It is almost insoluble in water.

Potassii Acetas (Potassium Acetate). A white, very deliquescent powder, soluble in 0.5 part of water and about 3 parts of alcohol. Used as a diuretic. Dose: 1 Gm.

Potassii Arsenitis Liquor (Solution of Potassium Arsenite, Fowler's Solution). A clear or faintly opalescent liquid, having a pink color and a slight odor of lavender. Alterative and antiperiodic. Dose: 0.2 cc.

Potassii Bicarbonas (Potassium Bicarbonate). A colorless granular, permanent powder. Antacid and diuretic. Dose: 1 Gm.

Potassii Bromidum (Potassium Bromide). Colorless crystals, odorless, permanent; soluble in 1.5 parts of water; should be administered dissolved in plenty of water. Antispasmodic. Sedative. Dose: 1 Gm.

Potassii Chloras (Potassium Chlorate). Colorless plates or a white granular powder; odorless, permanent, soluble in 16 parts of water. Handle with care, as dangerous explosions are liable to follow trituration with organic substances like sugar, or oxidizable substances such as sulphur. Antiseptic and astringent. Dose: 0.25 Gm.

Potassii et Sodii Tartras (Potassium and Sodium Tartrate, Rochelle Salt). Colorless, transparent, rhombic prisms, or a white powder. It is odorless and has a cooling saline taste. Soluble in 0.9 part of water and is practically insoluble in alcohol. Used as a purgative. Dose: 10 Gm.

Potassii Hydroxidum (Caustic Potash). Fused, white masses; odorless, acrid tasting, deliquescent, caustic. Not used internally. Handle with care. Burns the fingers.

Potassii Iodidum (Potassium Iodide). A white, granular powder, deliquescent, soluble in 0.7 part of water and in 22 parts of alcohol. Irritant to the stomach and should be given in plenty of water. Alterative and resolvent. Dose: 0.3 Gm. Antiluetic 2 Gm.

Potassii Nitras (Potassium Nitrate, Saltpetre). Colorless, transparent, six-sided rhombic prisms or a white, crystalline powder. It is odorless with a saline taste. Soluble in 2.8 parts of water and 620 parts of alcohol. Diuretic and diaphoretic. Dose: 0.3 Gm.

Potassii Permanganas (Potassium Permanganate). Odorless, slender, monoclinic prisms, of a dark-purple color, almost opaque by transmitted light, and of a blue, metallic luster by reflected light. Soluble in 13.5 parts of water. It is decomposed by alcohol. Deodorant and germicide. Popular remedy for snake bite, applied to wound. Also used locally, in saturated solution, on poison ivy rash. Dose: 0.06 Gm.

Procainae Hydrochloridum (Procaine Hydrochloride). Small, colorless crystals or a white crystalline powder. It is odorless. Soluble in 0.6 part of water and in 30 parts of alcohol. Used as a local anesthetic as a substitute for cocaine.

Pruni Virginiana. (Wild Cherry). Used in cough mixtures. Dose: 2 Gm.

Quininae Sulphas (Quinine Sulphate). Hard, prismatic monoclinic needles, or white, silky, light, flexible, glistening crystals, making a very light and easily compressible mass. It is odorless and has a persistent, very bitter taste. Soluble in 725 parts of water and 107 parts of alcohol. Tonic and antimalarial. Dose: Tonic: 0.1 Gm. Antimalarial; 1 Gm. daily.

Resorcinol (Resorcin). Colorless, needle-shaped crystals or powder. Has a faint, characteristic odor and a sweetish, followed by a bitter, taste. Soluble in 0.9 part of water and in 0.9 part of alcohol. Antiseptic, disinfectant and antiparasitic. Used internally as a diaphoretic and antipyretic. Dose: 0.125 Gm.

Santoninum (Santonin). Obtained from Santonica flowers. Colorless crystals, turning yellow on exposure to light, odorless, nearly tasteless, insoluble, permanent; colors the urine a greenish-yellow or reddish-purple. Anthelmintic. Dose: 0.06 Gm.

Scopolaminae Hydrobromidum (Scopolamine Hydrobromide, Hyoscine Hydrobromide). The hydrobromide obtained from the plants of Solanaceae. Anesthetic, mydriatic. Dose: 0.0005 Gm.

Sinapis Nigra (Black Mustard, Brown Mustard). A light brown or greenish-brown powder. Used as a stimulant, condiment, and emetic. Dose: Emetic: 10 Gm.

Sodii Benzoas (Sodium Benzoate). A white, odorless, amorphous, granular or crystalline powder, soluble in 1.8 parts of water and 61 parts of alcohol. Antirheumatic and antiseptic. Dose: 1 Gm.

Sodii Bicarbonas (Sodium Bicarbonate). A white, odorless powder having an alkaline taste; soluble in 12 parts of water, insoluble in alcohol. Antacid. Dose: 1 Gm.

Sodii Bicarbonas et Menthae Piperitae Tabellae (Soda-mint tablets). Antacid. Dose: 1-2 tablets.

Sodii Boras (Powdered Borax). A white, odorless, efflorescent powder, having a sweetish taste. Soluble in 15 parts of water and in equal part of glycerine; insoluble in alcohol. Used as an astringent. Dose: 0.75 Gm.

Sodii Bromidum (Sodium Bromide). A white, granular powder, odorless; soluble in 1.1 parts of water and 16 parts of alcohol. Used as a sedative. Dose: 1 Gm.

Sodii Cacodylas (Sodium Cacodylate). A white, granular powder, odorless and deliquescent. Soluble in 0.5 part of water and about 2.5 parts of alcohol. Alterative. Dose: 0.06 Gm.

Sodii Carbonas Monohydratus (Monohydrated Sodium Carbonate). A white, odorless powder having a strongly alkaline taste. When exposed to the air, under ordinary conditions, it absorbs only a slight percentage of moisture. Soluble in 3 parts of water and in 7 parts of glycerine; insoluble in alcohol. Antacid. Dose: 0.25 Gm.

Sodii Chloridum (Sodium Chloride, Common Salt). Emetic and antiseptic. Dose: 15 Gm.

Sodii Citras (Sodium Citrate). Small crystals or a white, granular powder, odorless with a cooling, saline taste. Diuretic, antilithic and antipyretic. Dose: 1 Gm.

Sodii Hydroxidum (Sodium Hydroxide, Caustic Soda). Dry, white or nearly white, fused masses or sticks. Soluble in 0.9 part of water; very soluble in alcohol. Used in preparation of Liquor Sodii Hydroxidi. Handle with care. Burns.

Sodii Iodidum (Sodium Iodide). Colorless, odorless, cubical crystals or a white crystalline powder. Soluble in 0.55 part of water and 2 parts of alcohol. Alterative and resolvent. Dose: 0.3 Gm. Antiluetic 2 Gm.

Sodii Nitris (Sodium Nitrite). White, or nearly white, opaque, fused masses or sticks, or colorless, transparent crystals, or a white or slightly yellow, granular powder. It is odorless and has a mild saline taste. Soluble in 1.5 parts of water and sparingly soluble in alcohol. Diaphoretic, antispasmodic and diuretic. Dose: 0.06 Gm.

Sodii Phosphas Exsiccatus (Exsiccated Sodium Phosphate, Sodium Phosphate Anhydrous). A white, hygroscopic powder. Used as a laxative. Dose: 2 Gm.

Sodii Phosphas Effervescens (Effervescent Sodium Phosphate). This salt affords a pleasant means of giving sodium phosphate as a laxative. Dose: 10 Gm.

◁ *Sodii Salicylas* (Sodium Salicylate). White scales, or a colorless powder with a faint pink tinge; odorless and having a sweetish taste; soluble in about 0.9 part of water and in 9.2 parts of alcohol. Irritating to the stomach and should be dissolved in an abundance of water. Antirheumatic and antineuralgic. Dose: 1 Gm.

Sodii Sulphas (Sodium Sulphate, Glauber's Salt). Large, colorless odorless, transparent, granular crystals. Soluble in equal part of water. Insoluble in alcohol. Used as a purgative. Dose: 15 Gm.

Sodii Thiosulphas (Sodium Thiosulphate, Sodium Hyposulphite). Colorless crystals, odorless and having a cooling taste; soluble in 0.5 part of water and insoluble in alcohol. Used chiefly externally in parasitic diseases of the skin. Dose: 1 Gm.

Strophanthinum (Strophanthin). A poisonous white or yellowish powder. A glucoside obtained from Strophanthus. Soluble in water and diluted alcohol. A cardiac stimulant. Dose: 0.0005 Gm. daily; may be given intravenously.

Strychninae Sulphas (Strychnine Sulphate). The salt of an alkaloid obtained from Nux Vomica. Colorless, efflorescent crystals, or a white powder, odorless and intensely bitter. Soluble in 31 parts of water. Tonic and cardiac stimulant. Dose: 0.002 Gm.

Sulphonethylmethanum (Sulphonethylmethane, Trional). Colorless, odorless scales with a bitter taste; soluble in 195 parts of water. Used as a hypnotic. Dose: 0.75 Gm.

Sulphur Lotum (Washed Sulphur). A fine yellow powder, odorless, tasteless and insoluble. Used as a laxative. Dose: 4 Gm.

▽ *Sulphur Sublimatum* (Sublimed Sulphur, Flowers of Sulphur). A fine yellow powder, having a faint odor and taste. It is practically insoluble in water and nearly insoluble in alcohol. Used internally as a laxative and diaphoretic and externally as an ointment in scabies and other skin diseases. Dose: 4 Gm.

Talcum Purificatum (Purified Talc). A very fine, white, or grayish-white, powder. It is insoluble in water and alcohol. Used as a filtering medium.

Terpini Hydras (Terpin Hydrate). Colorless, lustrous crystals or a white powder. Soluble in 200 parts of water and 13 parts of alcohol. Expectorant, diuretic and diaphoretic. Dose: 0.25 Gm.

Thymol (Thymol) A phenol occurring in the oil of thyme. Colorless crystals having an aromatic odor and taste. Soluble in about 1000 parts of water; freely soluble in alcohol. Antiseptic and anthelmintic. Dose: Antiseptic: 0.125 Gm.; Anthelmintic: 2 Gm. (divided into 3 doses).

Thymolis Iodidum (Thymol Iodide). A bright chocolate-colored or reddish-yellow powder insoluble in water. Used as an antiseptic dusting powder.

Thyroideum (Thyroid) It is the cleaned, dried and powdered thyroid gland, previously deprived of connective tissue and fat. It is obtained from the domesticated animals which are used for food by man. A yellowish, amorphous powder. Used when thyroid secretion in one's body is deficient. Dose: 0.06 Gm.

Tolu (Tolu, Balsam of Tolu). A yellowish-brown solid, readily soluble in alcohol; nearly insoluble in water. It has a pleasant, aromatic odor, resembling that of vanilla, and a mild aromatic taste. Antiseptic. Expectorant. Diuretic.

Toxitabellae Hydrargyri Chloridi Corrosivi (Poison Tablets of Corrosive Mercuric Chloride, Corrosive Sublimate Tablets, Bichloride Tablets). Tablets of an angular shape, not discoid, each having the word "POISON" and the skull and cross-bone design distinctly stamped upon it. These tablets are colored blue. Each tablet weighs about 1 Gm. and contains not less than 0.45 Gm. nor more than 0.55 Gm. of corrosive mercuric chloride, the remainder consisting chiefly of either sodium chloride or ammonium chloride. Used in making solutions for external use only.

Trinitrophenol (Trinitrophenol, Picric Acid). Light yellow scales. Used chiefly externally for burns. The solution employed is 5 parts picric acid and 75 parts alcohol in 1,000 parts of water. Picric acid explodes when heated rapidly or when subjected to percussion.

Valerianae Tinctura (Tincture of Valerian). Used as a sedative. Dose: 4 cc.

Zinci Chloridum (Zinc Chloride). A white, odorless, granular powder or in porcelain-like masses. It is very deliquescent. Soluble in 0.25 part of water and about 1.3 parts of alcohol. It is used in solution as an antiseptic and disinfectant.

Zinci Oxidum (Zinc Oxide). A fine, white powder, insoluble, odorless and tasteless. Used externally, in ointment.

Zinci Oxidi Unguentum (Ointment of Zinc Oxide). Contains 20 percent Zinc Oxide.

Zinci Stearas (Zinc Stearate). A compound of zinc with stearic acid. A fine, white, bulky powder, free from grittiness. Used externally as an antiseptic dusting powder.

Zinci Sulphas (Zinc Sulphate). Colorless, efflorescent crystals; odorless and having an astringent, metallic taste; soluble in 0.6 part of water; insoluble in alcohol. Used externally and as an emetic. Dose: Emetic 1 Gm.

Zingiberis Fluidextractum (Fluid Extract of Ginger). Carminative and anodyne. Dose: 0.5 cc.

Stock Preparations. The following are some additional common preparations, unofficial as well as official, compounded or dispensed and kept in stock in the pharmacy, and frequently alluded to by the English name or synonym.

English Name or Synonym.	Latin Name.
Arsenic Antidote	Ferri Hydroxidum cum Magnesii Oxido
Basham's Mixture	Liquor Ferri et Ammonii Acetatis
Black Wash	Lotio Hydrargyri Nigra
Blaud's Pills	Pilulae Ferri Carbonatis
Blue Mass (Blue Pill)	Massa Hydrargyri
Brandy	Spiritus Vini Vitis
Brown Mixture	Mistura Glycyrrhizae Composita
Camphorated Oil	Linimentum Camphorae
Carron Oil	Linimentum Calcis
Chalk Mixture	Mistura Cretae
Charcoal	Carbo Ligni
Chlorinated Lime	Calx Chlorinata
Compound Chalk Powder	Pulvis Cretae Compositus
Compound Licorice Powder	Pulvis Glycyrrhizae Compositus
Cream of Tartar	Potassii Bitartras
Dakin's Solution	Liquor Sodae Chlorinatae Chirurgicalis
Diphtheria Antitoxin	Antitoxinum Diphthericum
Distilled Water	Aqua Destillata
Donovan's Solution	Liquor Arseni et Hydrargyri Iodidi
Emulsion of Cod Liver Oil	Emulsum Olei Morrhuae
Essence of Peppermint	Spiritus Menthae Piperitae
Flaxseed	Linum
Goulard's Extract	Liquor Plumbi Subacetatis
Gray Powder	Hydrargyrum cum Creta
Gregory's Powder	Pulvis Rhei Compositus
Hoffman's Anodyne	Spiritus Aetheris Compositus
Labarraque's Solution	Liquor Sodae Chlorinatae
Lime Water	Liquor Calcii Hydroxidi
Lugol's Solution	Liquor Iodi Compositus
Milk of Asafetida	Emulsum Asafoetidae

Milk of Magnesia	Magma Magnesiae
Mustard Plaster	Emplastrum Sinapis
Normal Saline (Salt) Solution	Liquor Sodii Chloridi Physiologicus
Oxgall	Fel Bovis
Seidlitz Powder	Pulvis Effervescens Compositus
Simple Elixir	Elixir Aromaticum
Soap Liniment	Linimentum Saponis
Soft Soap	Sapo Mollis
Spirit of Mindererus	Liquor Ammonii Acetatis
Squibb's Mixture	Tinctura Opii Composita
Sugar (Sucrose)	Sucrosum
Syrup of Ginger	Syrupus Zingiberis
Syrup of Wild Cherry	Syrupus Pruni Virginianae
Tetanus Antitoxin	Antitoxinum Tetanicum
Tincture of Green Soap	Linimentum Saponis Mollis
Vallet's Mass	Massa Ferri Carbonatis
Vinegar of Squill	Acetum Scillae
Washed Sulphur	Sulphur Lotum
Whisky	Spiritus Frumenti
White Precipitate	Hydrargyrum Ammoniatum
Yellow Wash	Lotio Hydrargyri Flava

Use of Heat in Pharmacy. For all pharmaceutical operations requiring a temperature below that of boiling water, an ordinary copper water-bath is used; as the vapor can escape freely, the temperature can not rise above that of boiling water.

Mechanical Subdivision of Drugs. It is usually necessary to reduce drugs to fine particles before employing them in the various operations of pharmacy. One of the most common of these procedures is called *trituration,* which is the process of reducing a drug to a fine powder by rubbing it up in a mortar; the pestle is given a rotary motion with downward pressure, describing a series of concentric circles from within outward, and then from without inward; should the powder begin to cake, it is separated from the surface of the mortar by a spatula.

Solution of Drugs. When a solid substance is dissolved in a liquid, both the process and the liquid are termed *solution.*

The liquid used to produce the solution with a solid, is called a *menstruum* or *solvent.* Sometimes two solids may be rubbed together, so as to make a clear liquid, as for instance, camphor and chloral hydrate.

Some hygroscopic solids are apt to run together and form cakes, if powdered before solution; such are the scale salts of iron, which will dissolve more readily in scale form.

The term "solubility," when applied to a drug, and no solvent is mentioned, always refers to water at ordinary temperature.

Saturated solutions are solutions which can not take up any more of the substance at ordinary temperature.

Percentage Solutions. These are solutions which contain a certain definite percentage of a given substance. Percentage solutions of solids should always be prepared by weight, while for liquid substances, weight or volume may be employed.

The quantity of each ingredient necessary to make a specified amount of any percentage solution, may be found as follows: *Multiply the amount of solution desired in grammes by the percentage, divide by* 100, *and the result will show the quantity of solid drug necessary; subtracting this amount from the quantity of solution desired, the remainder indicates the necessary amount of menstruum.*

Useful Solvents. Some of the most useful solvents of drugs are alcohol, chloroform, ether, glycerin, water, acids, alkaline solutions, and oils. The resulting solutions are given various names, such as tinctures, infusions, etc.

Water is the most useful of all solvents; nearly all salts of the alkalies, earths, and metals are dissolved by it, and many vegetable acids and salts of the alkaloids.

Alcohol is next in importance to water as a solvent. Its great advantage over water is that it makes the preparations in which it is employed keep indefinitely, while the watery solutions soon decompose. Resins, volatile oils, alkaloids, and glucosides dissolve in alcohol, while gum, albumen and starch are insoluble.

Glycerin is used on account of its antiseptic qualities, when alcohol can not be employed for any reason. It dissolves pepsin, tannins, some mineral salts and vegetable acids, and forms the basis of the *glycerites.*

Ether is especially valuable as a solvent for oils, fats, resins and some alkaloids and neutral principles.

Chloroform resembles ether in its solvent properties, and also dissolves phosphorus. It is non-inflammable and has a higher boiling-point.

Acids are used with water or alcohol, to extract the active principles of such drugs as cinchona. They are also used in the preparation of vinegars.

Alkalies dissolve resinous bodies, and the *oils* are used as a basis for liniments.

Infusions are made by pouring boiling water on vegetable substances, and letting them stand for various lengths of time. *Decoctions* are made by boiling the drug in water, and are used when there are no volatile principles to be driven off.

Maceration is a process of dissolving out active principles at ordinary temperatures. The mixture must be frequently shaken.

Percolation or *displacement* is one of the most important and generally useful processes of pharmacy. By means of it, a powder contained in a suitable vessel has its solid constituents dissolved out, by the descent of solvent through it. The apparatus in which the process is carried on is known as a *percolator* (Fig. 67) the resulting solution as the *percolate,* and the residue as the *marc.*

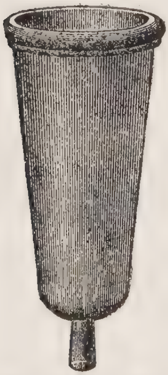


FIG. 67—Percolator.

Percolation, as directed in the Pharmacopoeia, consists in subjecting a comminuted substance or a mixture of substances, contained in a vessel called a percolator, to the solvent action of successive portions of a liquid termed the *menstruum* in such a manner that the liquid, as it traverses the powder in its descent to the receiver, shall extract the soluble constituents and pass from the percolator free from insoluble matter.

When the process is successfully conducted, the first portion of the liquid, or percolate, passing through the percolator, will be nearly saturated with the soluble constituents of the substance treated; and if the quantity of menstruum be sufficient for its exhaustion, the last portion of the percolate will be nearly free from color, odor, and taste, other than those of the menstruum itself.

Separation of Solids from Liquids. *Filtration* is the process of separating solids from liquids so as to render the latter more transparent.

Colation or *straining* is different from filtration only in that it is less thorough. For straining, filter-bags, conical in form, and made of felt or flannel, are usually employed.

For filtration, two kinds of paper filters are used, *plain* and *plaited.* Plain filters are usually employed when it is desired to collect the solid matter, called the precipitate. It is made by doubling a circular sheet of filter paper upon itself, then refolding this in the middle; the filter is then opened in such a manner that there is one thickness on one side and three thicknesses of paper on the other side of the cone, which exactly fits an ordinary funnel.

A plaited filter exposes a much larger filter surface, that does not come in contact with the funnel, thus effecting a much more rapid filtration. The method of preparing a plaited filter is shown in all works on pharmacy. In plaiting a filter, do not extend the creases entirely to the apex, for the point of the filter may be so much weakened that the weight of the liquid would tear it. The upper edge of the filter should not reach the top of the funnel; this is in order to allow the funnel to be covered to keep out dust. The filter should be moistened with water after placing in the funnel, and before adding the liquid to be filtered; the latter should be poured quietly on the side of the filter, so as not to rupture the point. In filtering into a bottle, place a piece of twine between the funnel and bottle, to allow the escape of air.

The process of separating a liquid from a solid, by pouring off the liquid, after the solid settles, is called *decantation;* it may be greatly assisted and the spilling of the liquid avoided, by using a glass rod as a director.

When the solid substance or precipitate is light and easily mixed with the liquid, it is better to use a *siphon.* This usually consists of an ordinary glass tube, bent at a rather acute angle, and with the two arms of different length. The siphon is first entirely filled with the liquid to be drawn off, and the shorter arm is then inserted in the liquid, taking care to keep the end of the longer arm below the surface level. The empty siphon may be inserted into the liquid and the flow started by suction on the long arm, provided the liquid is not corrosive or poisonous. A rubber tube may be used as a siphon, in place of a glass tube, and in the same way.

Separation of Volatile Matter. Volatile substances are separated from those which are less volatile, by the action of heat, and the process is known as *vaporization.*

The process of separating a volatile liquid from a less volatile one, by heat, is called *evaporation.*

When the purpose sought is to obtain the volatile liquid, it is called *distillation.*

When the purpose is to obtain the solid, it is called *desiccation.*

When it is wished to separate a volatile solid from another solid body, it is called *sublimation.*

Kinds of Official Preparations.[1]

Liquids.		Solids.	
Made without percolation or maceration.	Made by percolation or maceration.	Made by percolation or maceration.	Made without percolation or maceration.[2]
Aqueous Solutions. Waters. Solutions. Aqueous Solutions Containing Sweet or Viscid Substances. Syrups. Honeys. Mucilages. Emulsions. Mixtures. Glycerites. Alcoholic Solutions. Spirits. Elixirs. Ethereal Solutions. *Collodions.* Oleaginous Solutions. *Liniments.* *Oleates.*	Aqueous Liquids. Infusions. Decoctions. Alcoholic Liquids. Tinctures. Wines. Fluidextracts. Oleoresinous Liquids. Oleoresins. Acetous Liquids. Vinegars.	Extracts. Resins.	Powders. Triturations. Masses. Confections. Pills. Troches. *Cerates.* *Ointments.* *Plasters.* *Papers.* Suppositories.

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[1] Those used internally are in Roman type; those used externally, in italics.

[2] The preparations in this class are mostly extemporaneous.

Aquæ, waters, are solutions of volatile substances in water. They do not keep well and should be freshly prepared.

Cerata, cerates, are ointments made stiff with wax.

Chartæ, papers, are medicated papers such as mustard paper.

Collodia, collodions, have as their basis a solution of gun-cotton in alcohol and ether.

Decocta, decoctions, are made by boiling vegetable substances in water; little used.

Elixiria, elixirs, are sweetened, aromatic, alcoholic preparations serving as a pleasant vehicle for medicines.

Emplastra, plasters, are solid compounds, usually spread on muslin, and for external use. Example: Belladonna plaster.

Emulsa, emulsions, are suspensions of insoluble oily or resinous substances in water by means of some other substance, such as gum arabic or the yolk of egg, known as the *excipient.*

Extracta, extracts, are semisolid preparations obtained by evaporating watery or alcoholic solutions of the active principles of drugs.

Fluidextracta, fluidextracts, are permanent, concentrated solutions (usually alcoholic) of vegetable drugs of such strength that 1 Cc. of the fluidextract represents 1 Gm. of the drug.

Glycerita, glycerites, are mixtures of medicinal substances with glycerin.

Infusa, infusions, are prepared by treating vegetable substances with hot or cold, but not boiling water.

Linimenta, liniments, are solutions or mixtures of various substances in alcoholic or oily liquids, and intended for external use, with rubbing.

Liquores, solutions, are solutions of non-volatile substances in water.

Misturæ, mixtures, are suspensions of insoluble substances in water by the aid of some viscid body.

Oleoresinæ, oleoresins, are liquid preparations consisting principally of natural oils and resins extracted by ether.

Pilulæ, pills, are spherical masses to be swallowed whole. They consist of the active ingredients and the *excipient,* the latter being the substance used to make the mass adhesive and plastic. Glycerin and acacia are excipients.

Spiritus, spirits, are alcoholic solutions of volatile substances.

Suppositoria, suppositories, are solid bodies containing drugs usually incorporated with cacao butter and intended for use in the vagina, rectum, or urethra.

Syrupi, syrups, are concentrated solutions of sugar in water, with or without medicinal substances.

Tabellæ, tablets, consist of powdered drugs compressed into disc shape by machinery. They are extensively used in the field because they are convenient for transportation and for accurate dosage without weights or measures. Their disadvantages are that they are so firmly compressed that if swallowed whole many of them pass through the gastro-intestinal tract unchanged, and that therefore they must be first reduced to a powder before being taken. Others are very irritating to the stomach and should be dissolved freely in water before being administered.

Tincturæ, tinctures, are solutions of non-volatile substances in alcohol. Tincture of iodine is an exception, iodine being a volatile substance. Potent tinctures are of 10 per cent strength and other tinctures usually 20 per cent.

Trochisci, troches or *lozenges,* are small cakes of medicines incorporated with a mass which usually has sugar for a basis. They are used by allowing them to dissolve slowly in the mouth.

Unguenta, ointments, are soft, fatty mixtures of medicinal agents usually with a basis of lard and wax or petrolatum.

Non-Official Forms of Medicines. *Boúgia, bougie,* a urethral suppository.

Ca'psula, capsule, a small, hollow, gelatin receptacle for medicines, intended to be swallowed, and thus concealing the taste of its contents.

Catapla'sma, poultice.

Cha'rtula, small paper, the subdivision of powders into separate doses inclosed by small pieces of paper, folded.

Colly'rium, eye-water.

Di'scus, disk, a small, flat piece of medicated gelatin, used when the dose is small, especially with alkaloids, for application to the eye, or for use in hypodermic syringe.

E'nema, enema, a rectal injection.

Esse'ntia, spirits, essence, solution of volatile oil in alcohol.

Gargari'sma, gargle.

Gra'nulum, a small pill, a granule.

Hau'stus, draught, when a considerable amount of fluid is to be swallowed at one dose.

Inhala'tio, inhalation, a vapor.

Inje'ctio, injection.

Lo'tio, lotion, a wash.

Po'tus, drink, a draught.

Su'ccus, juice.

Tablet triturates. Triturations compressed into small masses, for exact dosage and convenience of administration.

Tablets, hypodermic. Small masses containing exact doses of substances used for hypodermic administration; some innocent but soluble substance is used as the basis.

Common Pharmaceutical Operations. Among the preparations which are most often made in the pharmacy are emulsions, pills, ointments, powders, and suppositories; it is, therefore, necessary to consider these operations a little more in detail.

Emulsions. Milk and yolk of egg are natural emulsions, the fat in each case being divided into minute globules which are surrounded with a film of albumen or casein by which they are suspended in water; the artificial emulsions are imitations of those existing in nature.

The most commonly used excipients are acacia and yolk of eggs (*vitellus*), but emulsions made with the latter must be used within a few days, as they do not keep well.

The method of preparing an emulsion which experience has shown to be the best is as follows: Add the oil, resin, etc., to a proper quantity of the excipient and mix both thoroughly in a mortar (Fig. 68). Then add enough water to equal one-half the weight of the previous mixture, and triturate the whole rapidly and unceasingly until the emulsion is homogeneous and of a whitish color. Next add the remainder of the water slowly, with continual stirring, finally incorporating the other ingredients, if any.

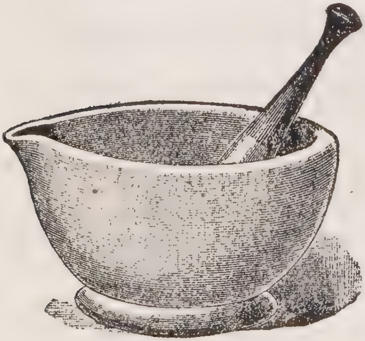


Fig. 68.—Wedgewood Mortar and Pestle.

Pills. Pills should not exceed 0.5 Gm. in weight unless composed of a heavy substance such as calomel. The ingredients should be weighed out separately, commencing with that of which the smallest quantity is ordered, and thoroughly rubbed up in a mortar; the excipient is then added and the rubbing continued until the mass is of the proper consistence and does not show any particles of any one ingredient. If the mass sticks to the pestle it is removed with a spatula (Fig. 69) and may be kneaded a few minutes in the fingers. It should be placed upon the pill tile, which has been previously dusted with a little lycopodium, and rolled into a long cylinder by the aid of a broad spatula until the mass is of a length corresponding to the division on the tile scale which represents the number of pills to be made.

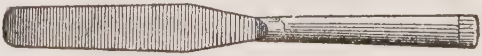


Fig. 69.—Spatula.

The mass should then be placed along the scale and a cut made through it with the spatula at each division, the pieces being at once rounded separately into pills by the thumb and the two fingers of each hand. A pill machine may be used for the division of the portions.

The pills are then left to dry while the label is being written, after which they are placed in a pill box with a little lycopodium to prevent their sticking together.

The excipient to be used is usually left to the discretion of the compounder. Some substances such as the softer extracts and gum resins need no excipient, but may be made at once into pills.

Among the more generally used excipients are:

Glycerin: Valuable on account of its property of attracting moisture and thus preventing the pills from getting too hard.

Syrup: Should not be used for metallic salts, especially calomel, which it reduces in a short time.

Mucilage of Acacia: For vegetable powders not adhesive.

Water: For vegetable powders containing mucilage.

Alcohol: For resinous substances.

Soap: Best for resinous and fatty substances, and essential oils.

Ointments. Ointments are usually prepared by rubbing the ingredients together in a mortar, or thoroughly incorporating them on a pill-tile with the aid of a firm spatula. When resins or waxes are to be incorporated with fats, or medicines are used which are soluble in warm fats, melting is used. When extracts, powders, or gritty substances are ordered, the ingredients should first be finely powdered, then rubbed with a small quantity of the basis into a smooth, impalpable paste, the remainder of the basis being added gradually until the whole is thoroughly incorporated.

Soluble salts should be triturated with a little water before adding the basis. Camphor needs a little alcohol to enable it to be pulverized. Volatile substances should be added last to allow of as little evaporation as possible.

Powders. Substances which are insoluble and too bulky to be prescribed in pills are often ordered in the form of powder. The ingredients are to be thoroughly mixed and accurately divided. The mixing is usually done in a mortar unless it is explosive, but may be effected on a pill-tile with the aid of a spatula. Substances such as alkaloids are very active and when employed in small doses require some inert substance to give them bulk sufficient for division and handling; sugar of milk is usually employed for the purpose. The active ingredient is placed in the mortar first and thoroughly mixed with a small quantity of the diluent, the addition being gradually continued.

Powders are dispensed in bulk when the dose is large, or in papers, *chartulas,* when the dose is small.

Hygroscopic and effervescent powders should be dispensed in waxed paper, others in ordinary white paper. The paper should be cut to fit the powder and folded to fit the box. It should be the rule to weigh out separately each dose of the active ingredients.

Suppositories. Rectal and vaginal suppositories usually have Cacao butter as a basis, while glycerinated gelatin is commonly employed for the urethra. *Rectal suppositories* are cone-shaped and weigh from one to two grammes. *Urethral suppositories* are pencil-shaped, and either seven centimeters in length, weighing two grammes, or fourteen centimeters in length, weighing four grammes. *Vaginal suppositories* should be globular or egg-shaped and weigh about four grammes.

Cacao butter suppositories are prepared by reducing the medicine to a powder or softening it, and then rubbing it up in a mortar with an equal quantity of the finely grated excipient until a smooth paste is formed, after which the remainder of the excipient is slowly added. A little castor-oil or glycerin may be added to make the mass more plastic. Next roll the mass on a graduated tile until a cylinder of the proper length is formed, divide this into the required number of equal parts, and with a spatula form them into the desired shape. Cacao butter suppositories may also be prepared by melting the ingredients together and molding them.

Gelatin urethral suppositories are prepared by dissolving or thoroughly mixing the medicine with a little water and sufficient glycerin to make the weight of the mixture one-half that of the finished product. Then carefully incorporate it with an equal weight of melted glycerinated gelatin, and pour it at once into suitable molds which have been greased with a small quantity of petrolatum. Cool the molds before removing the suppositories.

Weights and Measures. Three different systems of weights and measures are used in this country, *avoirdupois weight, apothecaries' weight,* and *metric weight.*

Avoirdupois weight is used in the purchase and sale of drugs. The divisions of avoirdupois weight are the pound, ounce, drachm, and grain, which are represented by the following characters: lb., oz., drm., gr.; each pound contains 16 ounces and each ounce 16 drachms or 437½ grains. The term drachm is rarely employed, quantities less than an ounce being usually designated by common fractions, such as 1/16 oz., ⅛ oz., ¼ oz., or in grains.

Apothecaries' weight is frequently employed in the writing and compounding of physicians' prescriptions, and is divided into grains, scruples, drachms, and ounces, of which 20 grains are equal to 1 scruple, 3 scruples are equal to 1 drachm, and 8 drachms are equal to 1 ounce.

TABLE OF APOTHECARIES' WEIGHT

Grain. (Gra'num) gr.	Scruple. (Scru'pulus.) ℈	Drachm. (Dra'chma.) ʒ	Ounce. (U'ncia.) ℥	Pound. (Li'bra.) lb.
20.	1.			
60.	3.	1.		
480.	24.	8.	1.	
5,760.	288.	96.	12.	1.

TABLE OF APOTHECARIES' MEASURE

Minim. (Mi'nimum.) ♏	Fluidrachm. (Fluidra'chma.) fʒ	Fluidounce. (Fluidu'ncia.) f℥	Pint. (Octa'rius.) O.	Gallon. (Co'ngius.) C.
60.	1.			
480.	8.	1.		
7,680.	128.	16.	1.	
61,440.	1,024.	128.	8.	1.

The *metric* or *decimal system* is prescribed for use in the medical department of the army. The name *metric* is derived from one of the units of the system, the *meter* or unit of length, which is the forty-millionth part of the earth's circumference around the poles.

The unit of capacity is the *liter,* which is equal to 1,000 cubic centimeters. The unit of weight is the *gramme,* which is the weight of one cubic centimeter of water at its maximum density. The prefixes which indicate multiplication are Deka (10), Hecto (100), and Kilo (1,000), while division is indicated by Deci (1-10), Centi (1-100), and Milli (1-1000).

The system resembles the United States money system, which is also decimal; in the latter the dollar is the unit, and there are mills (1-1000), cents (1-100), dimes (1-10), and eagles (10); like the money system, too, only a few of the terms are used in pharmacy; thus we use cubic centimeters (Cc.), kilogrammes (Kilo), gramme (Gm.), and milligramme (Mgm.); also the term ½ gramme and ¼ gramme may be employed. Fractional parts of a dollar may be written in several ways, thus: $0.50, 50 cents, and 500 mills, all mean the same thing, and so do grammes 0.50, 50 centigrammes, and 500 milligrammes; but while we use cents as applied to fractional parts of a dollar, we usually employ milligrammes as applied to fractional parts of a gramme.

Concerning the *relative values* of these two systems of weights and measures, there can be no question of the *great advantage of the Metric* over the Apothecaries' system. The former is founded upon a *decimal basis* and everything is in tens; thus it is easier to compute amounts and divide doses; it is expressed more easily; then, again, there is an exact correspondence between the metric system of weights and the measures—one cubic centimeter of water at 4° C. weighing exactly one gramme. In the Apothecaries' system, such an exact correlation does not exist, the minim not weighing exactly one grain, and one fluidounce of water (480 minims) weighing only 455 grains; the difference is, however, only trifling, and in the case of liquids having a specific gravity differing but little from that of water, need not be considered; and thus we can, as a rule, take *one minim* as the equivalent of *one grain.*

The quantities are expressed much more simply in the Metric than in the Apothecaries' system; instead of being required to place the sign before each figure, we place on the top of the column the words "grammes," or "cubic centimeters" and then below this the figures, separating the whole numbers from decimals either by a line or period; or "grammes" or "cubic centimeters" may be abbreviated to "Gm." or "Cc."

Translation from one system into the other can be done very easily, as will be seen from the following tables. The approximate equivalents are the ones ordinarly to be employed, the exact ones being added for reference only:

TABLE OF EQUIVALENTS

Length

Meters.	Inches.
1	39.37
0.1	3.93
0.01	.39

Capacity

Liters	Fluidounces	Minims
1	33.81	
0.01 (Cc.)		15

Weight

Grammes	Grains	
1	15.43	(15½ approximately).
0.1	1.54	(1½ approximately).
0.01	.15	(1/6 approximately).
0.001	.015	(1/60 approximately).

To convert metric weights and measures into those in ordinary use, and *vice versa,* multiply by the corresponding equivalents.

To convert:

Meters into inches, multiply by 39.370.

Example: 39.370
5

5 meters .... 196.850 inches.

Liters into fluidounces, multiply by 33.815.

Example: 33.815
5

5 liters .... 169.075 fluidounces.

Grammes into grains, multiply by 15.432.

Example: 15.432
5

5 grammes .... 77.160 grains.

Inches into centimeters, multiply by 2.539.

Example: 2.539
5

5 inches .... 12.695 centimeters.

Fluidounces into cubic centimeters, multiply by 29.572.

Example: 29.572
5

5 fluidounces .... 147.860 cubic centimeters.

Grains into grammes, multiply by 0.064.

Example:

$$\begin{array}{lr} & 0.064 \\ & 5 \\ \hline \text{5 grains} \ldots\ldots\ldots\ldots\ldots\ldots & 0.320 \text{ gramme.} \end{array}$$

Pharmacists can not be too careful in the use of metric weights and measures in the writing and reading of prescriptions. In Europe, where the metric system has been in use for many years, no signs are used in prescriptions, because all ingredients, whether solid or liquid, are weighed, and it is understood that weight is always intended; whenever, for any reason, measures are wanted, the signs "L." (liter) and "Ccm." (Cubic centimeter) are employed. But in this country, where it is still customary to weigh solids and to measure fluids in the dispensing of medicines, the official abbreviations given in the U. S. Pharmacopœia should be used invariably, so as to avoid all possible confusion. With water, and the average diluted alcohol tinctures, it would probably not make much difference whether grammes or cubic centimeters were dispensed, but in the case of all liquids having a higher or lower specific gravity than water a marked variation will be observed; thus 20 Gm. of glycerin measure 16 Cc., and 20 Cc. of glycerin weigh 25 Gm.; 60 Gm. of simple syrup measure 45.5 Cc., and 60 Cc. of syrup weigh 79.02 Gm.; 30 Gm. of chloroform measure 20.13 + Cc., and 30 Cc. of chloroform weigh 44.7 Gm.; 4 Gm. of bromoform measure only 1.4 Cc. and 4 Cc. of bromoform weigh 11.32 Gm.; 10 Gm. of ether measure 13.77 + Cc., and 10 Cc. of ether weigh only 7.26 Gm.; 50 Gm. of alcohol measure 60.97 + Cc., and 50 Cc. of alcohol weigh 41 Gm.

Incompatibility of Drugs. *Incompatibility* of drugs means unfitness for combination in the same prescription. Incompatibility may be chemical, pharmaceutical, or therapeutical.

In *chemical incompatibility* a chemical reaction takes place resulting in the formation of precipitates, explosives, or poisonous compounds. Combination of cinchona preparations with salts of iron forms an inky mixture; of nitric acid with glycerin an explosive substance; of dilute hydrocyanic acid with calomel a virulent poison.

In *pharmaceutical incompatibility* no chemical action takes place, but precipitation and an unsightly mixture often results; the addition of aqueous solutions to resinous tinctures illustrates this principle.

Therapeutical incompatibility arises when two agents which oppose each other in their action on the system are prescribed together, such, for example, as morphine and atropine. It is always to be borne in mind, however, that chemically or therapeutically incompatible drugs are often prescribed together intentionally to serve a definite purpose.

It will be well to mention certain *underlying principles* which should be considered when we order mixtures of two or more remedial agents.

1. *Water* is the solvent usually employed for soluble salts, for acids, sugars, gums, vegetable extractive matters, and for albuminous and gelatinous compounds.

2. *Alcohol* is usually employed for dissolving volatile oils, oleoresins, resins, gum-resins, camphor, balsams, and vegetable substances containing oily and resinous principles.

3. When more than small amounts of *aqueous solutions* are *added to alcoholic solutions,* or *vice versa,* a *precipitation* of previously dissolved principles often ensues, and an unsightly or otherwise undesirable mixture results. This is, however, not always the case, for the substance, which is dissolved in the alcohol, may also be soluble in water, or may be soluble in a mixture of alcohol and water, and thus no change will occur.

4. Free *acids unite with bases,* forming salts.

5. *Strong acids and bases* (such as inorganic acids, lead, mercury) *displace weaker acids and bases* (such as organic acids, potassium, lithium).

6. *Salts* in solution *exchange acids or bases,* if, by so doing, a *precipitate can be formed.*

7. The occurrence of an apparent incompatibility, such as a precipitate in a solution, may be desirable, as in the cases of *black* and *yellow washes* (made by adding calomel and corrosive sublimate respectively to lime water) ; here this fact should be made known by adding to the directions on the bottle that the mixture is to be *shaken* before using.

8. Agents rich in Oxygen (*oxidizing*) when *mixed* in concentrated form *with readily oxidizable substances may cause explosions.* Hence Potassic Chlorate and Permanganate, strong Nitric, Nitro-hydrochloric, and Chromic Acids (all powerful oxidizing agents) *should not be* mixed with dry vegetable powders, Tannic Acid, Sugars, Glycerin, Alcohol, tinctures, Ether, Sulphur, and Phosphorus.

9. A drug should never be prescribed with any of its tests or antidotes.

TABLE OF MOST IMPORTANT MUTUALLY PRECIPITANT SOLUTIONS

P. = Precipitate.	Alkaloidal solutions.	Solu. of metallic salts (in general).	Solu. of lead salts.	Solu. of silver salts.	Solu. of calcium and barium.	Solu. of magnesium salts.	Albuminous solutions.	Gelatinous solutions.	Tannic acid and vegetable astringents.
Solutions of Alkalies	P.	P.	P.	P.	P.	P.			P.
Tannic Acid and Vegetable Astringents	P.	P.	P.	P.	P.		P.	P.	
Solutions of Carbonates	P.	P.	P.	P.	P.	P.			
Solutions of Sulphates and Sulphuric Acid			P.	P.	P.				
Solutions of Phosphates and Phosphoric Acid	P.	P.	P.	P.	P.	P.			
Solutions of Borax and Boric Acid	P.	P.	P.	P.	P.				
Solutions of Chlorides and Hydrochloric Acid			P.	P.					
Solutions of Bromides and Hydrobromic Acid			P.	P.					
Solutions of Iodides, of Iodine, and Syrupus Acidi Hydriodici	P.		P.	P.					
Solutions of Sulphides and Sulphurous Acid	P.	P.	P.	P.	P.	P.			
Arsenical Solutions	P.	P.	P.	P.	P.	P.			
Albuminous Solutions		P.	P.	P.					

The Scales and Weights. The most useful instrument in pharmacy is the balance or scales. The form usually employed is a single beam with equal arms. The beam or lever is divided at the center into two equal arms by a knife edge upon which it rests. There are also, at each end of the beam, knife edges upon which the scale pans are suspended, these knife edges being hard and indestructible, and usually of agate.

The scale pans are generally of nickel or silver, but for weighing corrosive substances glass scale pans are employed.

The balance should be enclosed in a glass case and carefully protected from moisture, corrosive vapors, dust, and from jarring and shaking. It should be kept very clean by polishing with chamois skin and dusting with a camel's hair brush.

Weights are usually of brass or aluminum, and platinum is also used for small weights, on account of its hardness and resistance to corrosion.

The term *tare* denotes the weight of the empty vessel or container in which the substance is to be weighed; *gross* weight includes both the substance and the container, while *net* weight is the weight of the substance alone.

Measures in pharmacy are used for liquids only; ordinarily they are of glass and known as *graduates.*

Approximate measurements. The number of drops contained in a certain volume of liquid varies according to its density and the size and shape of the vessel from which it is dropped; a drop is not identical with the *minim.*

The following table gives certain domestic measures and their equivalents:

One teaspoonful = 1 fluidrachm
One dessertspoonful = 2 fluidrachms
One tablespoonful = 4 fluidrachms or ½ fluidounce
One wineglassful = 2 fluidounces
One teacupful = 4 fluidounces
One tumblerful = 6 to 8 fluidounces

According to the U. S. Pharmacopœia, the following are the metric equivalents:

One teaspoonful = 4 Cc.
One dessertspoonful = 8 Cc.
One tablespoonful = 15 Cc.

Filling Prescriptions. (*Extemporaneous Pharmacy.*) This includes a variety of operations, and requires a knowledge of the meaning of the Latin words and abbreviations ordinarily used in prescription writing, as well as great care and accuracy in the various steps necessary.

A *prescription* is an order to the druggist to deliver to the patient certain medicines. Such orders are written in Latin, this language presenting decided advantages. It is customary to have so-called "prescription blanks" on hand, and a convenient size for these is three and one-half inches by five inches.

Each prescription may be considered to be composed of five parts: (1) The preliminaries. (2) The name of the drug or preparation ordered, or two or more of such names. (3) The quantity of such ingredients. (4) Directions to the pharmacist as to what he is do with these ingredients. (5) Directions to the patient as to how the medicine is to be taken.

(1) The Preliminaries. Besides the portion relating to the compounding and dispensing of the medicine ordered, each prescription should have added the name and address of the prescriber, the name of the patient, and the date.

The address may be written or printed at the top of the paper, and is to be followed by the date, just as in writing a letter. The name of the patient is also to be placed above, and is preceded by "For." The prescriber's name is signed below. Should any special directions to the druggist, not intended to be put upon the label attached to the medicine, be added, such as "Not to be repeated," "To be repeated once only," etc., they are to be written either above or below the main subject matter of the prescription.

(2) The Name of the Drug or Preparation. Regarding Pharmacopœial nomenclature, the following may be noted:

The *title of a vegetable drug* is, with few exceptions, its *botanical genus-name;* it is represented by a *single term,* unless more than one part of the plant is official, in which case the part of the plant desired is specified in addition. Thus we say: *"Aconitum,"* because only the root is official; but *"Colchici Cormus"* and *"Colchici Semen,"* because both parts are official.

Pharmacopœial salts are usually designated by the Latin of their *chemical* names, with the basic name first in the genitive, followed by the acid name in the nominative. Thus: *"Magnesic Sulphate"* is *"Magnesii Sulphas," i. e.,* "of Magnesium, the Sulphate." In a few instances, the common names are employed instead of the chemical ones, as *"Alumen"* for "Potassio-aluminum sulphate." When *two classes of the same salt* are employed, one is distinguished from the other by a *difference in nomenclature, chemically,* such as "Sodii Carbonas" and "Sodii *Bi*carbonas," "Liquor Ferri *Sub*sulphatis" and "Liquor Ferri *Ter*sulphatis" or by some reference to their *physical* or *physiological* qualities, such as "Hydrargyri Chloridum *Corrosivum*" and "Hydrargyri Chloridum *Mite,*" "Hydrargyri Oxidum *Flavum*" and "Hydrargyri Oxidum *Rubrum.*"

Adjectives follow the nouns which they qualify; thus: "Cinchona Flava," "Yellow Cinchona." When two nouns occur together in drugs and chemicals (not in preparations), the genitive following "of" is placed first; thus: "Belladonnæ Radix," "Of belladonna, the root."

Each ingredient of a prescription is to be the genitive case, since it follows *"Recipe."* We say: "Take of so and so a certain quantity." The only exceptions to this rule are the following:

When we order a definite number or size of any pharmacopœial preparation, the latter is to be in the accusative case, since it is now the direct object of "Recipe." Thus we say: "Take twelve Compound Cathartic Pills," "Recipe Pilulæ Hydrargyri Chloridi Mitis Compositæ, numero xij."

Again: "Take a Belladonna Plaster six inches by four inches" is "Recipe Emplastrum Belladonnæ six inches by four inches." But if we directed the druggist to "take a certain quantity of Belladonna Plaster, and then so spread this upon adhesive plaster," we would write: "Recipe Emplastri Belladonnæ, ʒ ij.; extende supra emplastrum resinæ, six inches by four inches."

When we have ordered one or more ingredients, and wish to *add enough* water or other *liquid,* so as *to give a desired bulk,* without stopping to compute the exact amount necessary, we may order the final ingredient in the following manner: "Take Water up to a certain quantity." Here "water" would be the direct object of "Recipe," and thus be in the *accusative* case, thus: "Recipe, *Aquam,* ad 120 cc." The latter phrase can also be rendered: "Take of Water a *sufficient quantity* up to 120 cc." "Recipe, Aq*uæ*, *quantum sufficiat* ad 120 cc."

(3) The Quantity of the Ingredients. These are placed in the accusative case, being the direct object of "Recipe;" but it is not only customary, but is advisable, to express quantities in symbols and not to write them out.

The cardinal numerals are usually represented by the Roman symbols: i., ii., iii., iv., etc. It is customary to draw a line over the symbol and to dot the I. This is an additional safeguard against mistakes, since the number of dots should correspond to the number of I's; when the symbol I is final, it is usually modified, and the fact of its being the final number indicated by changing it into a "j"—thus "j."

(4) Directions to the Pharmacist. As to what he is to do with the ingredients which have been ordered:

These begin with the ℞, the abbreviation of "recipe," at the commencement of every prescription. The ingredients and quantities also apply to him, for he is directed to take those different substances in specified quantities.

Where a certain number or certain quantity of an official preparation is ordered, there may be no further directions for the pharmacist except "*Signa,*" "Label," and then the directions to the patient.

But where two or more ingredients are combined, after enumerating these, we direct the pharmacist to mix—"*Misce.*" In the case of all preparations excepting pills, powders, suppositories, and troches, this would be all that would be necessary. But it is a little more elegant to add "*Fiat*———," mentioning the form of medicine which we have prescribed, the name of the medicine being in the nominative singular, after the passive imperative "Fiat;" thus: "Fiat mistura," "Fiat linimentum," "Fiat unguentum," "Fiat collyrium," etc.

In the case of pills, suppositories, and troches, we direct the pharmacist to "make a mass and to divide it into a certain number of pills, suppositories, or troches. This we may express in either of the following ways:

Fiat massa, et divide in pilulas (suppositoria, trochiscos), numero——; or
Fiat massa, in pilulas (suppositoria, trochiscos), numero——dividenda.

"Pilulas," "suppositoria," and "trochiscos" being in each case in the *accusative plural after* the preposition *"in." "Dividenda"* always *agrees with "massa."*

In the case of a *powder* which is to be divided into a certain number of *papers,* we direct the pharmacist to *"make a powder and to divide this into a certain number of papers,"* and again we have two methods of expressing this:

Fiat pulvis, et divide in chartulas numero——, or
Fiat pulvis, in chartulas numero —— dividendus.

Here we say "dividend*us*," to agree with "pulvis."

It is quite common in Europe to order a single dose of a powder, pill, troche, or suppository, and then to direct the pharmacist to *"make of such doses a certain number."* This method is occasionally employed in this country, and, then, supposing we wished twelve papers of Dover's powder each weighing 0.3 Gm., we would write for:

Recipe:
Pulvis Ipecacuanhæ et Opii......Gm. 4.

Fiant chartulæ tales doses numero xii., or we may also say: Fac Chartulas tales doses numero xii.; in this case, "chartulas" is in the accusative plural after "fac."

In ordering pills, it is not necessary for us to specify the substances which are to be used in making a pilular mass; this belongs to the pharmacist. Very often, however, the substances ordered in pills, such as extracts, are themselves all that are necessary for making a suitable pill mass.

Next, we direct the pharmacist to "label"—"Signa."

Other Latin words and phrases, with the abbreviations most commonly used in prescriptions, are the following:

A'dde, add.—ad.
Ad li'bitum, at pleasure.—ad lib.
Ante ci'bum, before food, before meal,—a. c.
Ad satura'ndum, to saturation.
Be'ne, well.
Ana, āā, of each.
Bis, twice.
Bis in di'e, twice daily,—b.i.d.
Bu'lliat, let (it) boil.
Ci'bus, food.
Cochlea're ma'gnum, a tablespoon.
Cochlea're parvum, a teaspoon.
Co'la, strain.
Colluto'rium, a mouth-wash.
De'in, thereupon.
Dimi'dius, half.
Di'vide, divide,—div.
Do'sis, a dose.
Et, and.
Exte'nde, spread.

Exte'nde su'pra, spread upon.
Fac, make.
Fi'at (sing.), *Fi'ant* (plur.), let (it, them) be made (into)—**F.**
Fi'ltra, filter.
Grada'tim, gradually.
Gu'tta, a drop,—Gtt.
Gutta'tim, drop by drop.
Ho'ra, an hour—h.
In di'es, daily.
Lage'na, a bottle.
Li'bra, a pound.
Li'nteum, lint.
Ma'cera, macerate.
Ma'ne, in the morning.
Ma'ne pri'mo, early in the morning.
Mica pa'nis, a crumb of bread.
Mi'sce, mix—M.
Non, not.
No'cte, at night.
No'cte mane'que, at night and in the morning.
Nu'merus, a number—No.
Nu'mero, in number—No.
Octa'rius, a pint—O.
Pa'rtes æqua'les, equal parts—p. e.
Post ci'bum, after food, after meals,—p. c.
Pro re na'tâ, as required—p. r. n.
Qua'ntum sufficiat, as much as is necessary—q. s.
Qua'qua ho'ra, every hour—q. h.
Re'cipe, take—℞.
Satura'tus, saturated.
Sca'tula, a box.
Se'mel, once.
Semissis, a half—s.s.
Semidra'chma, a half drachm.
Si'gna, write, mark—sig.
Si'mul, together.
Si'ne, without.
So'lve, dissolve—solv.
Sta'tim, immediately.
Suffi'ciat, may suffice.
Ta'les, such.
Ta'les do'ses, such doses.
Te're, rub.
Te're si'mul, rub together.
Ter in di'e, three times a day—t. i. d.
Tri'tura, triturate.

(5) Directions to the Patient. These are to be written in English, and are to be definite. The words *"as directed,"* having absolutely no value, are never to be employed. No greater proof of the uselessness of these words can be given than to state that when a prescription is sent out without directions, pharmacists are in the habit of labelling: "Use as directed."

Notes on Compounding and Dispensing. *Compounding* means the preparation of the various drugs ordered, while *dispensing* includes putting them up and issuing them.

To fill a prescription, first read it over carefully until it is thoroughly understood; then number it and write a label. Invariably write directions before dispensing. Avoid thus the use of blotting paper; a good dispenser uses almost none. Whenever one is available, use the typewriter, as that assures a neat label.

Next measure out the ingredients, checking each one off to prevent duplication, compound them as directed, and dispense. Always make a quick check on your ingredients in order to be sure that you are using what is ordered in the prescription. In short, carefully read the label on the stock bottle or other container. By doing so you will avoid serious mistakes. Poisonous prescriptions should be plainly labelled *Poison.* All prescriptions should be filed in the prescription book.

Prescriptions should not be refilled without an order from a medical officer in each case; the date refilled should be noted on the prescription and on the label.

In compounding, if the mixture contains readily soluble ingredients never use a mortar.

Avoid effecting solution by heat, for fear of recrystallization.

With syrups and also ingredients not water, arrange in dispensing to rinse out the measure and leave it clean; a skilled dispenser shows very little traces of his work.

Carefully clean and put away weights and scales after each operation.

Learn to judge of the quantity of ingredients to be weighed with tolerable accuracy; train the eye as well as the hand.

If in doubt, always begin with that about which you have no doubt.

Be rapid in manipulation. Finish wrapping, tying, or sealing quickly. Slow dispensing is bad dispensing, and arises either from deficient practice or want of knowledge.

Never hesitate when in doubt to ask advice from fear of compromising your own dignity.

Whenever the dose to be taken by a patient seems excessive quietly ascertain from the *prescriber* if such dosage is *intentional.* In filling a prescription invariably check-up on this matter of dosage. By doing so you may occasionally detect and be able to correct in time an error of serious consequence to the patient.

CHAPTER XIII

HYGIENE AND SANITATION

Introduction. In the military service we interpret the term *hygiene* as a *science* having a personal application to an individual, and the term *sanitation* as the *art* of applying the laws of hygiene to groups of individuals. The two combined we usually classify under the heading of *preventive medicine.*

In plain terms, hygiene means keeping in good health, and when we speak of personal hygiene we refer to those precautions which every man *can* take in his own efforts to prevent disease and thus keep himself at all times in the best possible physical condition.

In most of the wars of the past more men have died from disease than have been killed in battle. Many of these deaths from disease can be prevented if every man does his part toward following the principles of hygiene. Not only should you observe hygienic and sanitary rules yourself, but you should insist that each of your comrades does the same.

Medical soldiers always should set a good example and try to arrest in their incipiency any unhygienic or insanitary conditions that come to their attention, reporting to their immediate superiors such infractions which they themselves cannot remedy.

Water and its Purification. *The amount of water needed by the average man daily* for drinking purposes varies according to the amount of exercise he takes and the temperature of the atmosphere; a fair average is three or four pints in addition to that which he takes in food. On the march the amount is limited by the capacity of the canteen to about one quart, and this quantity should be very carefully husbanded.

The total daily allowance in the field is usually calculated at about two gallons per man; four and one-half quarts for drinking and cooking, two and one-half for washing, and one quart for wastage.

Waters are usually divided into two classes: *surface waters* and *ground waters.* The former include rain, river, lake, and pond waters, and the latter, well and deep spring waters.

A water is said to be *potable* when it is fit to drink. It is the duty of the Medical Department to see that troops use for drinking purposes only water possessing the proper degree of purification. A potable water is an *uncontaminated* water; no matter how clear, bright, and sparkling a water may be, it is not potable if it is so situated that it can be fouled by fecal matter, urine, or the drainage from manured lands. There is a very erroneous belief that all spring water is pure; many springs, especially those which are not constantly flowing, draw their water from surface sources.

Water from *deep wells* is usually safe; from *shallow wells* suspicious. Whether a well is to be considered a deep or shallow well depends upon whether or not it passes through an impervious layer of rock or clay so that surface drainage cannot get into it; if it passes through such a layer it is a deep well; if it does not it is a shallow well.

Though *rain water* is originally pure, *cistern water* may be very impure; the impurities come from the washings of the roof from which it is collected, from dust blown into it, and if it is an underground cistern, there may be a crack through which surface drainage may enter.

Hard water is water that will not lather well with soap; the hardness is due to lime salts and may be partially removed by boiling; well water, especially deep well water, is usually hard.

Ice has the same impurities as the water from which it is made; therefore natural ice is often impure. Ice made from distilled water is usually very pure.

Water may be purified in three ways: by chemical treatment, by boiling or distillation, and by filtration.

Municipal water supply systems are a combination of sedimenting basins and filtering (sand) beds in which the water is treated chemically. The intake (source) may be miles away from the filtering beds feeding the distributing pipes. Large protected conduits carry the water from sedimenting basin to sedimenting basin and then finally into the filter beds.

Chlorine in various chemical combinations is a very valuable water sterilizer; it is used both for general water supplies on a large scale, usually preceded by filtration, and for small groups in the form of small tubes for soldiers on the march. Its destructive effect on bacteria is due to the action of the oxygen set free when the chlorine combines with the hydrogen of the water, to the chloramines formed, and the chlorine liberated.

The Lyster Bag. A very useful appliance for utilizing the bactericidal effect of chlorine on water was devised originally by Colonel William J. Lyster, Medical Corps, U. S. Army, and with certain improvements is used in the official method of sterilizing water for troops in the field. It consists of a *canvas bag* of capacity sufficient to hold 36 gallons of water.

At its opening, the *Lyster bag* is sewn over a galvanized-iron ring, hinged at one diameter, which permits the bag to be folded. When in use it is supported by 2 pieces of hemp rope attached to a metal trefoil. Just above the bottom seam, spaced at equal intervals, the bag is fitted with 5 self-closing faucets. The other accessories furnished are 2 collapsible canvas buckets, 2 yards of cheesecloth, and 1 box of *reagents* containing 50 tubes of *calcium hypochlorite,* 20 tubes of *sodium thiosulphate,* and 30 ampules of *orthotoluidine.* The entire outfit is carried, for purposes of cleanliness and protection, in a canvas case of the carpet-bag type. In equipment tables this complete assembly is known as a "water sterilizing set" and weighs 17 pounds. (Fig. 70. For bag suspended, see left of Fig. 13).

As the *oxidation* of organic matter in water through the agency of hypochlorite proceeds best in clear water, it is desirable to remove fine clay and other comparatively coarse matters before introducing the hypochlorite. In the field it is probable that many surface waters will carry suspended matter to an extent that may interfere slightly with the hypochlorite process. To reduce this matter in amount, the piece of cheesecloth is used. Through this cloth the water is poured in filling the bag.

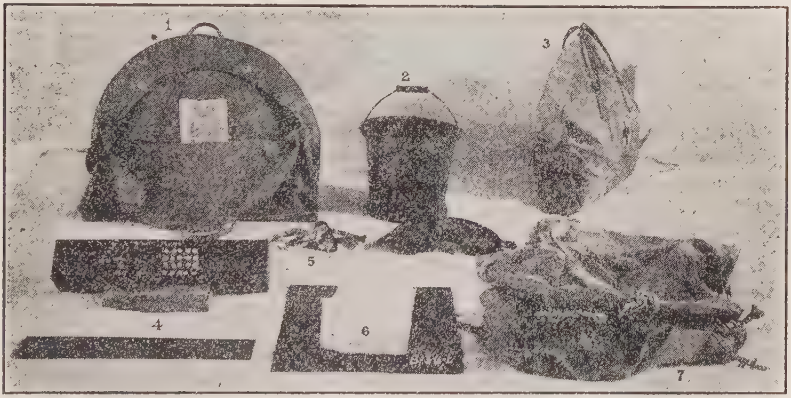


Fig. 70.—Components of Water Sterilizing Set. 1. Canvas case as a container. Instructions sewn inside. 2. Collapsible canvas bucket. 3. Complete water sterilizing set. 4. Box of reagents with protective pads and cover. 5. Suspension ropes and Todd trefoil. 6. Cheesecloth. 7. Lyster bag.

The official directions for the emergency disinfection of water in the Lyster water bag are printed on linen and sewn inside the canvas case. (Fig. 70). These directions are as follows:

I. Adjust the bag and its cover, and then strain through the cheese cloth enough water to fill the bag to within 4 inches of the top.

II. Place in the bag a long, clean, stick with which to stir the water. Do not remove this stick, for in so doing you may recontaminate the water.

III. Treat the water with calcium hypochlorite in order to destroy harmful bacteria.

Materials:

(1) Calcium hypochlorite—a white powder in amber glass tubes.
(2) Orthotoluidine (0.1% in 10% HCl)—a colorless liquid in clear glass ampules.
(3) Sodium thiosulphate—crystals—in clear glass tubes.
(4) A clean cup (model 1910).
(5) 2 spoons.

Method:

Add the contents of one tube of calcium hypochlorite (1) to half a cup of water and, after mixing it with a spoon, stir the mixture into the bag of water with the stick.

IV. Test the water with orthotoluidine (2) as follows to determine whether sufficient calcium hypochlorite (1) has been added: (a) draw 3 cupfuls of water from one faucet, and pour it back into the bag. Then fill the cup, within ½ inch of the top, with water from the same faucet. (b) Add the contents of one ampule of orthotoluidine (2) to this cup of water and stir with a clean dry spoon. *The appearance of an orange or orange-red color in the cup indicates that sufficient calcium hypochlorite has been added:*
However, if the color is lemon yellow, it will be necessary to add more calcium hypochlorite (1) to the water, testing with orthotoluidine (2) after the addition of each tube, until the desired orange-red color is obtained. Calcium hypochlorite (1), even when sealed in glass tubes, is very unstable, and therefore several tubes may be required in order to get the desired action.

V. Twenty minutes after the addition of calcium hypochlorite (1), draw 5 cupfuls of water from each of the faucets in order to wash and disinfect them. Pour this water back into the bag.

VI. Thirty minutes after the addition of the required amount of calcium hypochlorite (1) to the water in the Lyster Bag, add one tube of sodium thiosulphate (3) which has been dissolved in a cup of the water. This substance will neutralize any excess chlorine and rid the water of its peculiar odor and taste. The water will then be ready for use.

Note: The Lyster bag is the most convenient type of container to use, but in its absence galvanized iron cans or similar containers make satisfactory substitutes in which to effect chlorination. Even a canteen of water can be sterilized by making a strong solution (1 tube of calcium hypochlorite to 1 canteen full of water) and then adding about 6 cc. of the resulting solution to each canteen full of water requiring sterilization; *provided* that it is well shaken and about half an hour is permitted to elapse before drinking. Such water is not as palatable as one properly neutralized, as mentioned in VI above.

Boiling and *filtration* are also applicable in the field. Five minute's active boiling is sufficient to destory all the bacteria of waterborne diseases; it does not, however, clear water nor remove dissolved organic matter.

As it removes the gases of water it becomes flat to the taste, and must be *aerated* before use, but this is easily accomplished by shaking it up, or pouring from one vessel to another. To make the water palatable it must also be cooled.

Distillation is an efficient process of sterilizing water, but if the water is taken from a very polluted source offensive gases may pass over in sufficient quantity to cause a disagreeable taste, and perhaps diarrhea.

Filters. *Filtration* is a process requiring constant care and supervision. Individual or barrack filters, while they clear the water, are liable to increase rather than diminish the number of bacteria. Unless such filters are in perfect condition and frequently sterilized the bacteria grow into the substance of the filter, which finally becomes a culture medium.

Improvised filters intended only to clear muddy water are readily prepared. The simplest form is that so common in tropical countries, a small hole being dug in the sand near the edge of a stream, the water filtering through the intermediate sand or being caught on its way to the stream.

Another simple method is to take two barrels of different sizes, bore holes in the bottom of the larger and near the top of the smaller, place the smaller barrel inside the larger (fill in the intervening space with sand and sink both in the water (Fig. 71). Or the larger barrel may be left intact, holes being bored in the bottom of the smaller, and the water being poured in on the sand between the barrels (Fig. 72). Sand used for such purposes should always be washed and if possible sterilized before use, and this process should be frequently repeated during use.

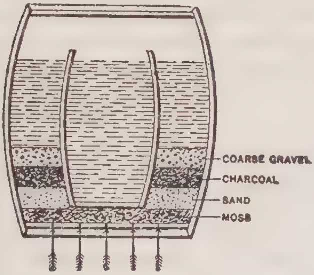


Fig. 71.—Improvised Filter.

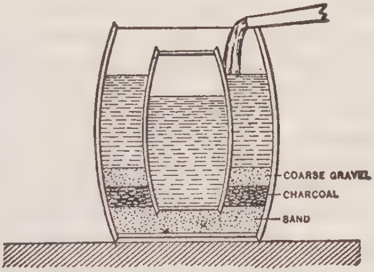


Fig. 72.—Improvised Filter.

Impure water may cause disease in several ways. Hard water or water containing mineral salts often causes diarrhea, constipation, or indigestion in those unaccustomed to its use. Decomposing vegetable or animal matter in water or the presence of living algæ may also cause gastrointestinal disturbances, but the great danger in the use of polluted water is the liability to swallow the germs of certain special diseases, notably typhoid fever, cholera, and dysentery. Great epidemics have been traced directly to the use of water fouled by the discharges from patients afflicted with those diseases.

A great many intestinal parasites, such as worms or their eggs, may be present in impure water.

Taking Samples. Medical soldiers should know how to take *samples of water* for analysis. For *chemical* analysis not less than three liters are necessary; for *bacteriological test* about 200 cubic centimeters are required. Samples should be collected in perfectly clean glass bottles stoppered with glass or clean new cork; if for bacteriological purposes, the bottle must be sterilized. If taken from a tap, water enough must be allowed to waste to empty the branch pipes; if from a pump, the barrel must be emptied; if from a pond, the sample must be taken from below the surface and at some distance from shore. The container should be held near the bottom. The top or neck of the bottle or naked part of the stopper should not be permitted to come in contact with any object during the manipulation.

Air and Ventilation. As we have already seen, air is a mixture of oxygen, nitrogen, carbonic acid, and watery vapor. Oxygen is the element that supports all animal life; it is being constantly withdrawn from the air in the processes of respiration and combustion, and returned to it, combined with carbon, as carbonic acid. Vegetable life takes up the carbonic acid and decomposes it, retaining the carbon and returning the free oxygen to the air, so that an equilibrium is maintained.

Watery vapor is a normal constituent of air, and the higher the temperature of the air the more it is capable of holding; when it will hold no more the air is said to be saturated. If air so saturated meets with a cooler stratum the excess of moisture is precipitated as *rain* or *dew*. *Humidity* refers to the amount of watery vapor in air; *relative humidity* is the degree of approach to saturation at any given temperature, while *absolute humidity* is the actual weight of the moisture in a given quantity of air.

Impurities. *The impurities of air* with which we have to deal in dwellings are dust and bacteria, organic matter, and harmful gases. The organic matters are particles of epithelium and the volatile products from the lungs and skin, from unclean mouths, noses, and the intestinal tract; in hospitals there are also pus cells from suppurating wounds, and the bacteria of infectious diseases. The effects of overcrowding and vitiated air are well known; immediately, there is headache, dizziness, and loss of appetite; when long continued, there is loss of bodily vigor and diminished resistance to disease.

Besides these indirect effects of vitiated air many diseases are directly caused by the inhalation of bacteria from air; among the most important air-borne diseases are tuberculosis, pneumonia, erysipelas, and possibly the eruptive fevers.

The pollution of air in dwellings is caused not only by the exhalations from the human body, but also by the products of combustion in heating and lighting.

Ventilation. The process by which the vitiated air of dwellings is removed and replaced or diluted by fresh air is known as *ventilation*.

For the maintenance of the human body in a fair degree of health and vigor, it has been found that about three thousand cubic feet of fresh air per hour must be supplied each person. The size of the air space which must be provided for each person depends upon the possibility of supplying this amount of air without causing draughts; if the entering air is warm, draughts of course are not felt so much as if it is cold.

As a matter of experience, it has been found that even when warmed the air of a room under the most favorable circumstances can not be changed more than three or four times an hour without causing a sensation of draught; so that the *minimum cubic air space per man* should be at least one thousand feet, which with three changes per hour will give the necessary three thousand cubic feet of fresh air; in the tropics the minimum cubic air space should be two thousand feet, with a floor space of not less than one hundred square feet. In computing the cubic air space in a room we multiply the length by the breadth and then by the height of the room, or by twelve if the height is greater than twelve feet. The reason we do not ordinarily count height above twelve feet is because above that height there is very little movement of the air in the room, unless there are special arrangements for its change.

The floor space, therefore, should be not less than one-twelfth of the cubic space.

In housing troops, Army Regulations permit, where necessary, a minimum of 60 square feet of floor space and 720 cubic feet of air space for each occupant in a squad room or other barrack dormitory. Whenever the space between the side bars of adjacent beds is not as much as 5 feet the men are required to sleep with the head of one man opposite the feet of two adjacent men. Normally not more than 6 men occupy a pyramidal tent, although for temporary occupancy 8 may be accommodated, as the ventilation of a tent offers no difficulities.

In hospitals, owing to the additional impurities from the sick, four thousand cubic feet of fresh air per man per hour should be allowed; the floor space should not be less than one hundred square feet, and the cubic space not less than twelve hundred feet in temperate climates, and 50 per cent more in the tropics.

The agencies concerned in ventilation are diffusion, and gravity or weight. *Diffusion* is not of much value and cannot be relied upon alone; the important agency is gravity. Equal volumes of air of the same temperature and under the same pressure have equal weights; now if one of the volumes is heated it expands and becomes lighter, and being surrounded by heavier air, rises, or rather is forced up, by the sinking of the heavier air, and thus currents are produced. When the air in a room is heated by fire, lights, or even the human body, it becomes lighter, and the heavier outside air forces itself in through all the openings and crevices, at the same time forcing the lighter air out, thus effecting a certain amount of ventilation.

Unequal temperatures in masses of air outside dwellings give rise to winds, and winds aid ventilation in two ways: First, by *perflation,* or blowing through a room when the windows are open, and second, by *aspiration* when it blows across chimneys or flues.

Ventilation of a dwelling is said to be either *natural* or *mechanical;* natural when we trust to the forces of nature, merely providing the necessary entrance and exit openings, together with heat if required; mechanical when the air is forced in or drawn out by fans or other mechanical means.

In any system it is necessary to remember that it requires two openings to secure ventilation; if only one opening is provided, the incoming and outgoing currents interfere with each other and ventilation fails. This is well illustrated by the familiar experiment of burning a candle inside of an unstoppered bottle; if the opening into the bottle is divided into two parts by a partition, the candle will burn, because the air currents pass up one side of the partition and down the other without interference; if the partition is removed the light goes out.

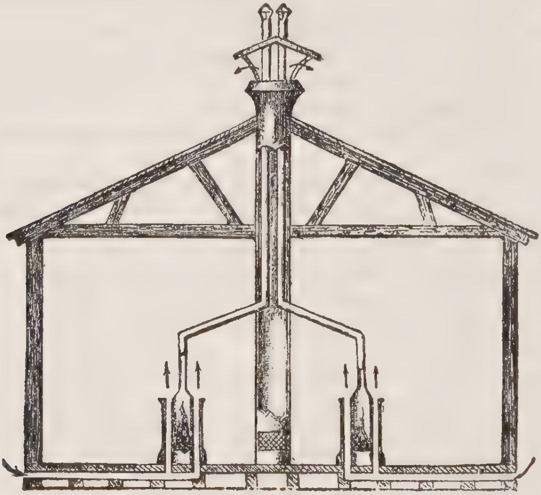


FIG. 73.—Heating and Ventilation by Jacketed Stove.

Ventilation in summer or in hot climates is largely a matter of the action of winds, because the temperature of inside and outside air is practically the same, so that we merely leave doors and windows open, and provide special openings in the ridge or under the eaves for the escape of the heated air in the upper parts of the building. Fans keep the air in motion; especially such devices as the *punkah*, or electric fans.

Heating. In winter the subject of ventilation is so intimately connected with that of heating that it is well to consider the latter before going into details of the arrangements for ventilation.

In the military service the methods for heating are practically confined to stoves and furnaces in the older buildings, hot water in the new hospitals, and steam in the new barracks. Stoves are employed in many temporary camps and almost exclusively in field installations.

Stoves are of very little value in assisting ventilation unless special arrangements are made with that end in view. This may be done by partially surrounding the stove from the floor to the level of the top of the stove by a sheet-iron jacket, and admitting fresh air under the stove from an air-shaft; if in addition to this the stove pipe is made to heat an extracting shaft, opening preferably at the floor level, ventilation may be very materially assisted (Fig. 73). Heating stoves in use should always have a pan of water on them to maintain the proper moisture of the air.

Furnaces are very valuable ventilators; fresh air is brought to the dome of the furnace by an air shaft, heated, and delivered, where required, through tin tubes.

In hot-water heating there are two systems, *low pressure* and *high pressure.* In the *low-pressure* system, which is that used in the army hospitals, a small, open tank is provided at the highest point of the system to allow for expansion and the escape of gases. The circulation of the water is due to the difference in weight of the columns of hot and cold water. The water is heated in a boiler in the basement; from the top of the boiler rises a *main,* with branches to all parts of the building; these branches terminate in *radiators,* and from the bottom of each radiator a *branch return* comes off, the branch returns uniting to form a *main return,* which empties into the lower part of the boiler. As the water in the boiler becomes heated it grows lighter, and the heavier water in the returns falls and forces up the hot water, thus effecting a *circulation* (Fig 74).

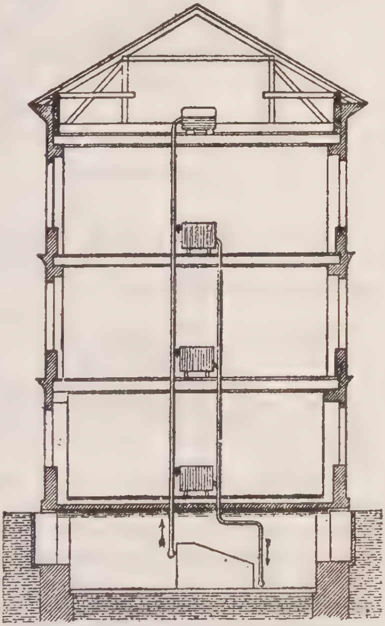


FIG. 74.—Heating by Hot Water. Low pressure.

In the *high-pressure* system the pipes are completely closed; hence there is some danger of explosion, but the water can be made hotter and circulation is more rapid.

Steam heating is the same in principle as the low-pressure hot-water heating, only steam is used instead of water, and the pipes constitute a closed system (Fig. 75).

Radiators heated by either steam or hot water may be placed in the room to be heated without any connection with the outside air; this is known as the *direct system;* or they may be placed in the basement or some other room, enclosed in a sheet-iron box connected with a fresh-air shaft, the warm air being then conducted to the room, the *indirect system;* or the radiator may be placed in the room to be heated and the fresh air brought directly in under and allowed to pass up between the pipes so as to be warmed, the *direct-indirect system;* the last is that commonly used in hospitals and barracks (Fig. 76).

When no special arrangements have been made for ventilation a useful and simple device is to place a strip of board under the lower sash, so that air can enter between the sashes and be directed upward (Fig. 121); or to pull down the upper sash and place a board sloping down over the opening left above (Fig. 122); air will enter between the sashes and escape above.

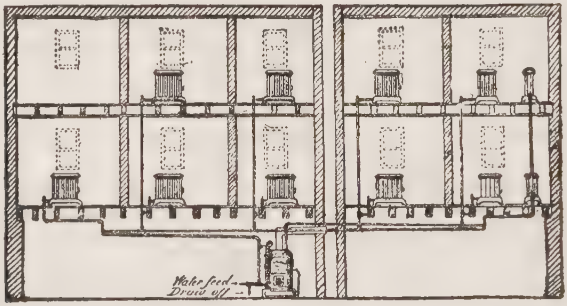


Fig. 75.—Heating by Steam. Low pressure.

The best simple test of the efficiency of ventilation is to notice the odor on coming into the room from the outside air; if it is stuffy and close, ventilation is imperfect.

Disposal of Wastes. The organic, dangerous wastes which it is necessary to dispose of in such a manner as not to invite disease are *night soil* (urine and feces), *slops* and *garbage;* the first is by far the most dangerous, containing, as it often does, the bacteria of disease. The arrangements for the reception of the night-soil may be pits, pans, or water-closets.

Pits are the most objectionable because they pollute the soil, may infect the water supply, and permit the access of flies, which may carry disease germs on their feet and bodies from the pits to the kitchens and barracks and there infect the food and drink.

Pans, usually used in connection with dry earth to cover and deodorize the feces, are little better than pits. They are open to the same objections, except that soil pollution from accidental spilling is not so marked; in addition they have to be emptied, thus affording another opportunity for scattering infection and creating a nuisance.

Water-closets and all plumbing fixtures in dwellings empty through sewers. *Cess-pools* are excavations in the ground which may or may not have a waterproof lining; if they do not have such a lining they are known as *leaching cess-pools.* Cess-pools are objectionable for the same reason as pits and pans.

Sewers are the pipes or channels which carry off the liquid wastes; the wastes themselves are known as *sewage.*

Water-closets and all plumbing fixtures in dwellings empty through short branches into a vertical iron pipe known as the *soil pipe,* and this in the basement empties into a more or less horizontal iron pipe called the *house drain,* and finally the house drain beyond the walls of the house terminates in the *sewer*. The arrangement of the house drainage system is shown in Fig. 77.

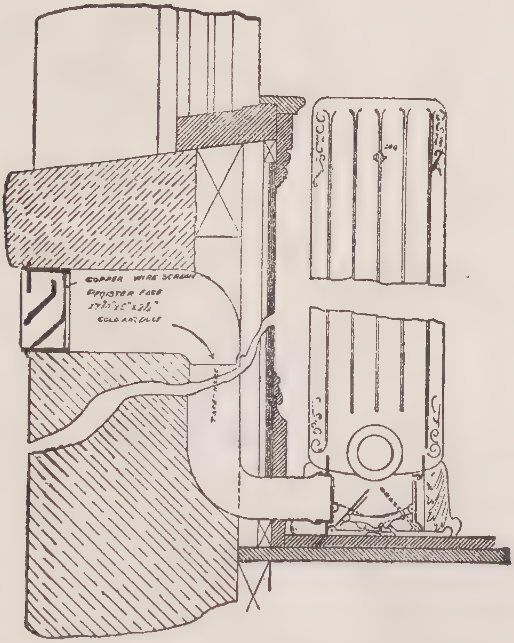


FIG. 76.—Heating by Direct-Indirect Method.

Traps are used on all fixtures, and these traps are usually *vented* to prevent siphonage. The purpose of the traps is to supply a water seal to prevent sewer gas from getting into the dwelling; the three-quarter S-trap is the type (Fig 78) The *flask trap* used by the Quartermaster's Department for lavatories and sinks is practically the same as an S-trap, in its interior arrangement. In yards and basements where the flow of water is intermittent a particular type of trap known as the *bell trap* is generally employed (Fig. 79); the objection to this trap is that in order to be efficient both the cover and the water seal must be in place, while as a matter of fact the one is often misplaced and the other soon lost by evaporation. A much better type of trap is shown in Fig. 80.

Sewage is disposed of by discharging into cess-pools, into running streams, upon sewage farms, and by the bacterial purification methods.

The purpose of the bacterial purification systems, which are now being used in the army to a considerable extent, is to liquefy and purify the sewage so that it may not unduly pollute the streams into which it is discharged. They consist essentially of two parts, a closed tank in which the bacteria which work in the absence of air liquefy the organic solid matters, and a series of filter beds in which the nitrifying or air-using bacteria continue the purification until the sewage should emerge as a clear, colorless liquid like water.

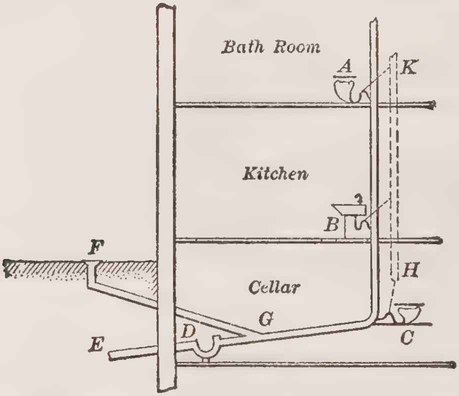


Fig. 77.—House Drainage. *A, B, C,* Plumbing fixtures; *D,* disconnecting trap; *E,* branch sewer; *F,* ventilation opening; *G,* house drain; *K, H,* vent pipes connected by dotted lines with each trap.

Garbage is best disposed of by burning in a crematory which is usually in operation in all the larger posts.

In the field the disposal of wastes, especially excreta, becomes a matter of greatest importance and considerable difficulty.

Abundant experience has proven that whenever large bodies of soldiers are collected together typhoid fever is sure to be introduced by some one, and that, unless the command is vaccinated and proper disposal made of excreta, the disease will spread through the agency of infected water, food, bedding, clothing, soil, dust, or flies.

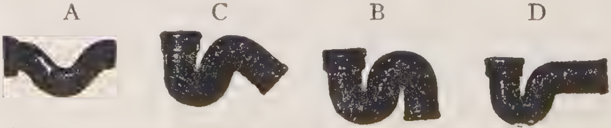


Fig. 78.—Different Forms of Traps. *A,* Running trap; *B,* S-trap; *C,* ¾ S-trap; *D,* ½ S-trap.

Latrines for the men are always located on the opposite side of the camp from the kitchens, generally one for each company unit and one for the officers of a battalion or squadron. They are so placed that the drainage or overflow can not pollute the water supply or camp grounds.

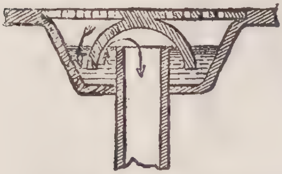


FIG. 79.—Bell Trap.

When the camp is for a few days only, straddle trenches suffice. (Fig. 81). In camps of longer duration, and when it is not possible to provide latrine boxes, as for permanent camps, deeper trenches should be dug. These may be used as straddle trenches, or a seat improvised. When open trenches are used the excrement must be kept covered at all times with a layer of earth. In more permanent camps the trenches, suitably enclosed, are not over 2 feet wide, and 6 feet deep. Their length is proportionate to strength of the organization using them. Seats with lids are provided and covered to the ground to keep flies from reaching the deposits; 20 inches of length is allowed for each seat, and the number of seats provided is 1/10 of the strength of the unit. Urinal troughs discharging into the trenches are provided, or separate soakage pits for urine (Fig. 82) may be dug. Each day the latrine boxes are thoroughly cleaned, outside by scrubbing and inside by applying when necessary a coat of oil or whitewash. The pit is burned out daily with approximately one gallon of oil and fifteen pounds of straw. When filled to within two feet of the surface, such latrines are discarded, filled with earth, and their position marked. All latrines and kitchen pits are filled in before the march is resumed. In permanent camps and cantonments, urine tubs may be placed in the company streets at night and emptied after reveille.

The proper disposal of garbage and stable refuse in camps is also a matter of importance, otherwise they pollute the soil and become a breeding place for swarms of flies; everything which is combustible must be burned; what cannot be burned must be buried.

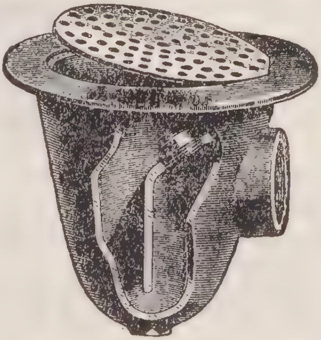


FIG. 80.—Improved Yard Trap

The burning may be done in the kitchen fire, or the solid garbage may be mixed with more combustible matter such as straw or manure, saturated with petroleum and burned. Manure should be burned in the same way as far as practicable.

Incinerators. In more permanent camps crematories—incinerators—

should be provided. The following crematory has proven very effective in practice.

At some convenient spot at the rear of the camp, a circular pit is dug three feet deep and fifteen feet in diameter. The bottom is covered with loose stones to the depth of fourteen to sixteen inches. On this is built a circumferential wall to the height of one foot above the original ground level, and the excavated earth is packed against it, clear to the top so as to provide a sloping approach and thereby prevent surface water gaining access to the pit. A pyramid of large stones, four or five feet high, occupies the center. This feauture is essential to provide central draft and steady fire.

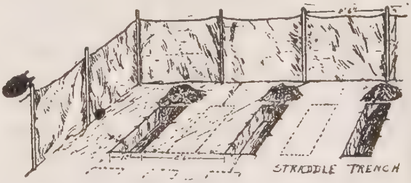


Fig. 81.—Straddle Trench. Used in camps up to one week's duration, or in rocky ground where it is difficult to dig deeper trenches.

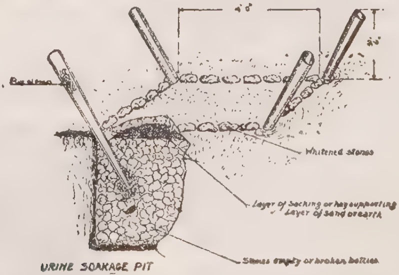

4'0"
3'0"
Whitened stones
Layer of sacking or hay supporting layer of sand or earth
Stones empty or broken bottles
URINE SOAKAGE PIT

Fig. 82.—Urine Soakage Pit. To be used only in pervious ground. Funnels of tin.

The bottom stones receive the liquid portions of the garbage without affecting the fire, and the heated stones soon evaporate and dissipate it.

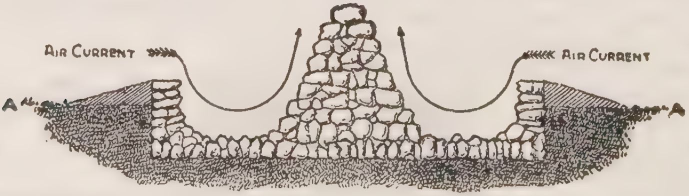


Fig. 83.—Crematory—Vertical Section. *A A*, Ground level.

The solid portions are soon desiccated and become fuel. Care should be exercised to empty the garbage into and not around the crematory.

For company kitchens a ∩-shaped rock incinerator, with the walls banked and the center scooped out, can burn the entire daily output of garbage. The fire-box area is about 4′6″ x 2′ x 1′6″.

Camp Sites. The general location of camps and bivouacs is determined by service requirements. A camp or bivouac must be located with reference to the main objectives of the troops. Every possible consideration is given to the requirements of sanitation, administration and supply, and the comfort of the troops.

The following sanitary considerations are of especial importance:

Drainage.—The site should be sufficiently high and rolling to drain off the storm water.

Dryness.—Porous soil covered with stout turf and underlaid by a gravelly or sandy subsoil is best; a clay subsoil is usually damp and impermeable. Alluvial soils, marshy ground, and ground near the foot of a range of hills are usually damp. Dry beds of streams are subject to sudden freshet. In selecting a camp-site always try to visualize what might happen should heavy rains ensue.

Freedom from Sources of Infection.—The available water supply should be free from contamination; the proximity of marshes or stagnant water is undesirable on account of mosquitoes and the diseases which they transmit; old camp sites are often permeated by elements of disease which persist for considerable periods.

Considerations of convenience of *administration* and *supply* include the following: Convenience of the site to an abundant water supply. Adequacy of roads leading to the camp, and of necessary communications within the camp. Ready availability of wood, forage, straw, and other supplies.

Comfort of the troops is promoted by selecting a shelter area large enough for their accommodation without crowding, and affording means of interior communication without compelling the troops of one unit to pass through the area of another; in hot weather, selecting a site shaded by trees, free from underbrush and sufficiently high to obtain the benefit of prevailing breezes; in cold weather, locating the site on ground sloping to the south, or with woods to break the north wind.

Immediately on going into shelter, guards are posted to enforce the proper use of the water supply. Places are designated for obtaining drinking and cooking water, for watering animals, for bathing, and for washing clothes. If the water supply is obtained from a small stream, these places are designated in the order stated, beginning upstream. The water supply furnished by small streams may be increased by building dams; springs may be dug out and lined with stones, boxes, or barrels. Surface drainage is kept out by a curb of clay. Water not known to be pure is chlorinated; or boiled, then cooled and aerated.

Camps must be kept in thorough police at all times. They are cleaned up daily after breakfast, and all refuse matter is buried or burned. Tent walls are raised, and the bedding and clothing are aired daily, weather permitting.

Tents, as soon as pitched, must be trenched; if the tent site is covered with grass the grass should be cut or pulled up, because it will die anyway and its decomposition will help to pollute the air; the soil should be well pounded and covered, if practicable, with a layer of ashes or gravel, also well pounded. In permanent camps the tents should be floored, but the floors should be in sections of such size that they can be readily removed for policing and sunning the ground underneath. No eatables should ever be allowed in tents, other than the kitchen and mess. The interval between tents in the same row should be at least equal to the height of the ridge.

All tents are crowded, not more than about eighty cubic feet of air space being usually allowed; therefore the greatest attention should be paid to ventilation; dry canvas allows some penetration of air, but moist canvas is practically impervious. Tent walls should always be kept looped up in summer, and even in winter whenever possible.

Immediately on going into bivouac, latrines are constructed; that is a measure of fundamental sanitary importance, since the most serious epidemics in the field are spread from human excreta, by carriage of germs of disease from them by flies, or by pollution of the water supply by drainage into it. Latrines for the men are always located on the opposite side of the camp or bivouac from the kitchens.

At night men who wish to urinate will often do so just outside the tent rather than go to the distant latrine; therefore urine tubs should be placed in the company streets every night, and removed in the morning; their position should be indicated by a lantern; the position of the latrines should also be indicated by a lantern on dark nights.

In evacuating a camp or bivouac, the site is thoroughly policed, fires put out, and latrines and kitchen pits covered.

Communicable Diseases and Their Prevention. When large bodies of susceptible individuals are brought together in intimate contact, especially under the more crowded conditions which necessarily prevail in the field, communicable diseases, once they appear, spread with great rapidity unless proper sanitary supervision is carefully exercised.

Recognizing this danger we take a "stitch in time" by immunizing all individuals against certain diseases which in the past have been the scourge of armies. Here we refer to the prophylactic vaccination and inoculation against smallpox, typhoid and para-typhoid fevers, given all at stated periods, and which afford a high degree of protection against those diseases. The method of administering this prophylaxis is described in Chapter XVII.

Communicable diseases roughly may be divided into certain groups, according to their method of transmission, viz.: respiratory, intestinal, insect-borne, and miscellaneous.

Respiratory.—Diseases attributable to discharges from the respiratory tract include: Measles, mumps, diphtheria, scarlet fever, the common respiratory diseases (coryza, acute laryngitis, acute tonsillitis, and acute bronchitis), influenza, the pneumonias, epidemic meningitis (cerebrospinal), pulmonary tuberculosis, whooping cough, and plague (pneumonic).

The *general* preventive measures to be taken against these respiratory-borne diseases include proper ventilation, adequate floor space, careful destruction of sputum, protection from those sneezing and coughing, cleanliness of floors and other surroundings, suitable clothing, and bedding sufficient to prevent the chilling of men while asleep. In many of these diseases *isolation* is imperative; the patient should be removed from contact with susceptible *individuals.*

Diphtheria is the only disease in this group against which we can confer general immunization; susceptible individuals and contacts may be immunized with diphtheria antitoxin.

Intestinal. Diseases transmitted by discharges from the intestinal tract include: Typhoid and para-typhoid fevers, the dysenteries, common diarrheas, food infection, food intoxication (botulism), helminthic (worm) infestations, and cholera.

The *general* preventive measures to be taken against these intestinal-borne diseases include sanitary control of water supplies, careful supervision over the handling, preparation, and serving of foods, rigid personal hygiene, the elimination of flies, and the proper disposal of human excreta. These measures are necessary notwithstanding the fact that all individuals are immunized against such diseases as typhoid and para-typhoid fevers. Patients suffering from these diseases must be *isolated.* Urine and feces of patients must be disinfected. Soil pollution must be prevented. Drinking water must be purified. Men must not be permitted to bathe in polluted water, lest they get it into their mouths. Kitchens and messes must be screened against flies, and all food protected from both flies and dust.

Diarrheas, which are so prevalent among troops in the field, are due to a variety of causes. Spoiled food, especially canned goods; infection of food by flies; faulty cooking; overeating improper food, particularly that purchased from camp vendors; exposure to chilling, especially at night; and impure water are common causes. Many diarrheas are probably merely symptomatic of graver disorders such as typhoid fever or dysentery, and should be carefully observed. The preventive measures are the supply of proper food, well cooked and protected from flies, the suppression of camp vendors, the furnishing of purified drinking water, and the general use of woolen undershirts sufficiently long to cover the abdomen. Such a shirt is much better than an abdominal band.

Dysenteries are of two types,—the *bacillary* or epidemic form, and the *amebic* or tropical form. They are controlled in the same way as the typhoid and para-typhoid fevers.

Botulism is due to a poison produced in canned goods by the action of bacilli not killed during the process of canning. Whenever this disease arises, all canned food on hand should be carefully examined.

Among the worm infestations, that due to the *hookworm* is the most important. Of lesser importance are infestations with *round worms* and *tape worms*. Hookworm eggs excreted in the feces of men develop in the soil into a larval form, the larvae coming in contact with the skin, burrow through and eventually reach the intestines, where they develop into adults. Eggs of the round worm excreted in feces of man infest other persons when ingested by them in water or food. Larval forms of the tape-worm are found in infested meats, and are acquired through eating uncooked, or partially cooked, beef or pork.

Hookworm infestation can be prevented by the proper disposal of human excreta, and constant wearing of shoes. Round worm infestation can be avoided by taking the ordinary precautions applicable in the spread of all intestinal diseases. Tapeworm infestation can be avoided by the proper inspection and cooking of meats.

Cholera is ordinarily confined to the Orient, but occasionally appears elsewhere in epidemic form as a result of imperfect quarantine. In preventing outbreaks of cholera the general measures above prescribed apply, and in addition all troops must be forbidden to eat or drink anywhere except in authorized places. A prophylactic vaccine against this disease has been developed and when administered confers temporary immunity.

Insect-borne. Diseases transmitted by insects include: Malaria, yellow fever, and dengue, which are transmitted only by certain species of mosquitoes; and plague, typhus, and relapsing fever, which are rarely transmitted otherwise than by certain insects. (Mosquitoes, flies, lice and bed bugs are described under separate headings below).

Preventive measures to be taken against these insect-borne diseases include protecting the patient from being bitten by insects capable of transmitting the disease, and protecting healthy persons from the bites of insects which have been infected; the eradication of all insects capable of transmitting the disease, and the eradication of the specific germ from the persons of patients.

Malarial fevers are spread in one way only; by the bites of an anopheles mosquito which has previously bitten a human being who has malaria.

To prevent malaria, avoid mosquito bites by the use of screens for doors and windows, nets for beds, and head nets and gloves when necessary at night; kill all mosquitoes in houses by fumigation or other means; destroy the breeding places of mosquitoes, and lastly in malarious localities give as a matter of routine administration small prophylactic doses of quinine. When an individual becomes infected, screen him carefully so as to prevent the access of mosquitoes to him.

Yellow fever resembles malarial fever in its method of spread, and in the measures of prevention, except that quinine has no value and is harmful in treatment.

Yellow fever differs from malarial fever in that its course is always acute, the fever seldom lasting longer than 5 to 7 days, and especially that one attack affords almost complete protection against a second, while in malaria one attack seems to predispose to others, and the infection of malaria may remain in the blood indefinitely.

Yellow fever is transmitted by the *aëdes (stegomyia) aegypti* mosquito, and thanks to the pioneer work of the late Walter Reed and his associates, is rapidly being eradicated from the face of the earth.

Dengue, or as it is more commonly known, "break-bone fever", is transmitted by the *aëdes* mosquito, and requires the same preventive measures against mosquito bites and the destruction of mosquitoes.

Plague is usually transmitted by rodents, principally rats, to man through the agency of rat fleas. There is also a pneumonic type, relatively rare as compared with the more common bubonic type, which is spread through discharges from the respiratory tract of infected persons. To control plague, rats and other rodents, particularly ground squirrels, must be exterminated by means of trapping, poisoning, fumigation, rat-proof construction of buildings, etc. Ships coming from an infected port should be watched for rats. Devices are strung on hawsers, etc., to prevent rats from getting ashore. All rat fleas, bed bugs and other blood sucking insects, should be exterminated. Workers in plague epidemics should take an immunizing vaccine, which gives a fair degree of protection.

Typhus is transmitted from one person to another by the louse, and perhaps by other insects. Preventive measures include the extermination of lice, by sterilization with steam of all clothing, bedding, equipment, etc. of typhus patients, the periodic delousing of the clothing and bedding of men in active campaign, the protection of typhus patients and other personnel from the bites of lice, and the frequent bathing of military personnel, especially during active campaign.

Relapsing fever is transmitted from man to man by means of lice, ticks and possibly by bed bugs, and the preventive measures are practically the same as for typhus.

Miscellaneous. Miscellaneous communicable diseases include scabies, smallpox, chicken-pox, tetanus, rabies, and last but by no means of least importance, the venereal diseases. The latter are discussed under Personal Hygiene.

Scabies is a skin disease produced by the action of certain small animal parasites commonly called "itch mites". The parasites are transferred from one patient to another through *contact.* To prevent scabies, cleanliness is essential and those infested should be isolated, have their skin treated, and their clothing, bedding, etc. disinfested.

Smallpox, the specific organism of which is unknown, is probably transmitted from one person to another by direct contact, and by contact with articles soiled with the discharges of infected individuals, and perhaps by flies. Preventive measures against smallpox include prophylactic vaccination of all individuals; and *isolation* of the patient until all lesions are completely healed.

Chickenpox, a mild disease, is probably transmitted in the same manner as smallpox, and resembles slight cases of the latter. Patients suffering from chicken-pox should be *isolated* until the lesions are healed.

Tetanus, or lockjaw, is caused by the tetanus bacillus, which ordinarily gains access to the human body through a wound. Preventive measures against lockjaw include personal cleanliness, the prompt treatment of all wounds, particularly gunshot and punctured wounds, and the administration of tetanus antitoxin. Because the soil of a battlefield, especially in cultivated areas, is contaminated with the tetanus bacillus, regulations require that all men wounded in action be given 1500 units of tetanus antitoxin, and that the fact of its administration be entered on the emergency medical tag, field medical card, etc. Subsequent doses are given if necessary. Patients with any other kind of wounds suspected of being infected with the tetanus bacillus are given similar prophylactic doses of antitetanic serum.

Rabies, or hydrophobia, is transmitted from the lower animals, usually the dog, to man by the injection of the saliva into wounds which have been produced by bites of the rabid animal. In man about forty days elapse between the time of being bitten and the development of the disease. Fortunately, this long incubation period affords ample opportunity for the administration of antirabic vaccine, more commonly known as the *Pasteur treatment,* a method of prophylaxis against the development of the disease which has proven highly satisfactory.

In addition to the vaccine other preventive measures include muzzling and leashing of all dogs, and carefully observing and examining the animal suspected of having rabies. When a clinical diagnosis of rabies in the animal is confirmed, he is killed and his brain is examined for specific evidences of the disease. As a matter of routine all bites produced by animals should be thoroughly cauterized with nitric acid and otherwise surgically treated.

There is now commercially available an antirabic vaccine which if administered universally and annually to dogs as a prophylactic measure, would go far towards eradicating this dreaded disease. This treatment does no harm to the dog.

Mosquitoes. As protection against certain diseases it is necessary to learn something about the life history of these pests.

Though all mosquitoes are annoying, only three kinds, as far as we know, carry disease; these are the *Anophelinæ*, which carry malaria,

Fig. 84.—Aëdes (Stegomyia) aegypti, male.

the *Aëdes* (*Stegomyia*) *aegypti*, which carries yellow fever and dengue, and the *Culex quinquefaciatus*, which in certain localities in the tropics carries a blood worm (*filaria*), which causes *elephantiasis*.

It is the female mosquito only that bites, and therefore the female only which conveys disease. *Aëdes* (*Stegomyia*) *aegypti* (the yellow-fever mosquito) is especially a day biter, and where mosquitoes are found biting in the daytime they are apt to be of that variety. Then again *Aëdes* is the blackest mosquito, and is beautifully marked with silver bands on the legs and body; a lyre-shaped silver mark on the back is characteristic and identifies *Aëdes* (*Stegomyia*). *ægypti* at once. This mosquito is of medium size (Figs. 84, 85).

The *Anophelinæ* (the malarial mosquito), Fig. 86, differ from *Aëdes* in having palpi as long as the proboscis in the female: this mosquito differs also from the other two in that the body and proboscis of the *Anophelinæ* form one straight line, while the other mosquitoes are humpbacked. The resting position of the *Anophelinæ* is nearly vertical to the surface, while that of *Aëdes* and *Culex* approaches the horizontal (Fig. 87).

The males of all mosquitoes are distinguished from the females by the fact that the former have feathered antennæ (wooly heads), while the latter have not (Figs. 84, 85).

The yellow-fever mosquito is essentially a domestic or house mosquito; that is to say, she breeds in small collections of water such as are found about a house, and does not stray far from home. *The malarial mosquito* is a rural or country insect; breeds in large pools, the still edges of running streams, irrigating ditches, etc., and is found far from human habitations.

When one of these mosquitoes bites a person afflicted with the disease which she is capable of carrying, she sucks a little blood and with it the germs of the disease. After a week or two these germs reproduce themselves in the mosquito, migrate to her salivary glands, and she then becomes capable of infecting other persons. If she now bites such a person, she injects into his blood with her saliva some of the germs, and after a variable period, known as the *period of incubation*, that person is

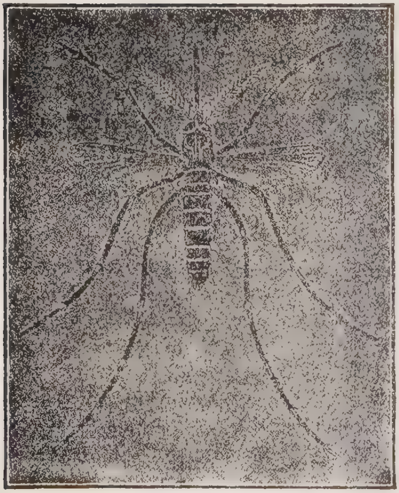


Fig. 85.—Aēdes (Stegomyia) aegypti, female.

usually taken down with the disease.

The measures to be taken to prevent such diseases are *destruction of mosquitoes, protecting the mosquitoes against infection by screening infected persons*—and in the case of malaria destroying the germs in their blood by the use of quinine; *protecting well persons from infection by the use of screens and nets,* and in the case of malaria, by the use of quinine to render the blood insusceptible to infection.

The Prevention of Breeding. Mosquitoes breed only in water, but very little water is required for the purpose. The female deposits her *eggs* to the number of 40–400 upon the surface of the water, and after a period of twenty-four hours to two or three days they hatch, becoming *larvæ* or *wiggle-tails;* the larval stage lasts one or two weeks until the *pupæ* form; after two to five days more the pupal shells (Fig. 91) split and the *imagos* or *adult insects* emerge.

The entire transition from egg to adult insect requires from ten days to two or three weeks.

Any collection of water, provided it is moderately still, answers the mosquito for breeding purposes. They breed in marshes, ponds, ditches, rain barrels, cisterns, gutters, watering troughs, hoof-prints, old tin cans, in fact anything capable of holding water. By allowing no unprotected water collections we prevent mosquito breeding. This is accomplished by draining and filling, and by removing all small articles capable of holding

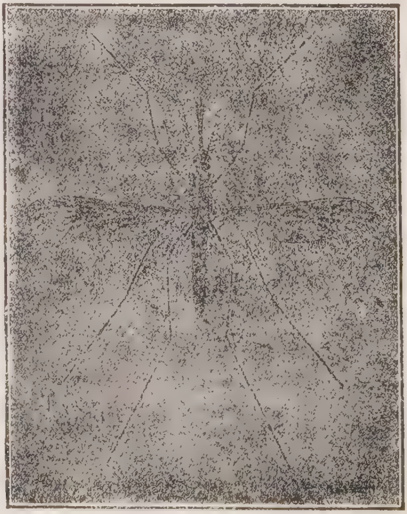


Fig. 86.—Anopheles quadrimaculatus, female.

water. Collections of water that can not be removed should be closely covered and screened, or else oiled with petroleum, about an ounce to each fifteen square feet of surface, the *petrolizing* being repeated about once a week.

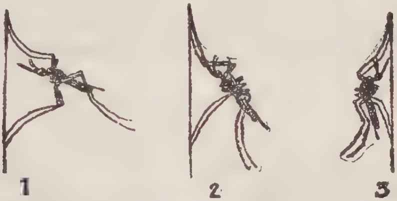


Fig. 87.—Resting posture of mosquitoes: 1 and 2, Anopheles; 3, Aëdes and Culex.

Adult mosquitoes may be destroyed by fumigating with sulphur or pyrethrum in the closed apartment, using about one pound to the thousand cubic feet of air space; if pyrethrum is used the mosquitoes are only stupefied, and must be subsequently swept up and burned.

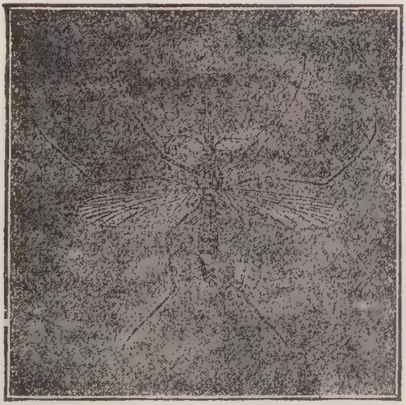


Fig. 88.—Culex quinquefaciatus, female.

Other measures for destroying mosquitoes are the clearing away of all vines, brush, tall grass, and undergrowth; such conditions do not breed mosquitoes, but they give them shelter against the winds, which would otherwise blow them away.

In the tropics the natives, especially the children, often carry malarial parasites in the blood, even though they show no sign of the disease, therefore camp should not be made *in* native villages, and natives should not be allowed about the barracks.

On active field service it is usually impracticable for soldiers to sleep under mosquito nets, but where malaria prevails a considerable degree of protection may be secured by requiring each soldier to wear gauntlets and a small head-net while asleep or on guard.

Flies. Under proper conditions certain flies, principally the house fly—*Musca domestica,* and the latrine fly, *Fannia canicularis*—are inimical to the health of man in that they serve as transmitting agents for pathogenic organisms.

These insects habitually feed upon and breed in filth and waste materials.

It is known that flies are capable of transmitting to man the causative organisms of typhoid and paratyphoid fevers, dysentery, epidemic diarrhea, tuberculosis, the helminthic infestations, and a number of other diseases. These organisms are present in the excretions of the infected person, and flies feeding upon or breeding in such material may easily become contaminated with some one of the infective agents.

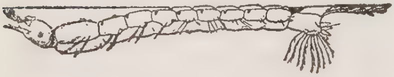


Fig. 89.—Larva of Anopheles mosquito.

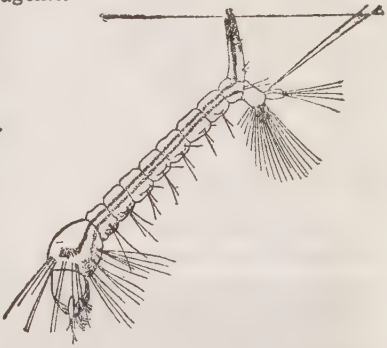


Fig. 90.—Larva of a Culex mosquito.

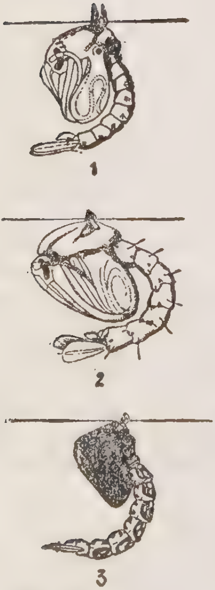


Fig. 91.—Pupæ: 1, Culex; 2, Anopheles; 3, Aëdes.

Flies carry disease germs either within the alimentary canal or upon the surface of the body and its appendages. Contaminated flies may deposit this infected material in food, water, open wounds, or upon the surface of the human body by simple contact, or by vomiting, or by excretion from the intestinal canal.

Life Cycle. In its life cycle the fly passes through four stages: *Egg, larva, pupa* and *adult.* The life span of the adult female fly is ordinarily from 4 to 6 weeks, during which time she lays about 500 eggs in batches of 75 to 200 each. These eggs are deposited in moist, fermentable material, such as horse manure, human feces, and ordinary refuse. Ordinarily the eggs hatch in less than 24 hours, depending upon the temperature and moisture.

The larval forms consist of small white maggots which crawl about and feed near the surface of the material, where the temperature is not excessive. Under favorable conditions, as regards temperature and moisture, the larvæ reach their full development in from 4 to 8 days, being then about one-half inch in length. They then migrate from the warm, moist material to the nearest dry earth. There they develop into pupæ, which are brown seedlike bodies slightly smaller than the larvæ.

Pupæ may be found in the ground to a depth of 2 feet and usually within a radius of about 4 feet from the material in which the eggs have been deposited. In the tropics the pupal stage lasts 3 or 4 days, and in the temperate zones from 7 days to several weeks. At the end of this stage the full-grown fly emerges from the pupal case, and makes its way through the soil to the surface. Flies do not increase in size after emergence from pupa cases.

The total period of development from the time the egg was laid until the full-grown fly appears requires from 10 days to several weeks, depending upon the temperature and moisture. The adult female fly begins to lay eggs about the ninth day after emerging from the pupa.

Under ordinary conditions the fly will migrate several hundred yards from the breeding place. Under very favorable conditions flights of several miles may be made in search of food and breeding places. A fly is attached to well-lighted places and avoids dark areas. It is very active when the temperature ranges from 80° to 90° F., but tends to seek shelter at 100° F. and above.

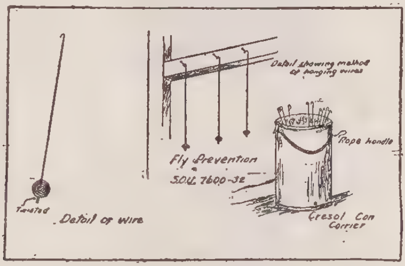


Fig. 92.—Wire Tanglefoot. Wires to be painted every two days with a mixture of castor oil and rosin.

The Elimination of Food Materials for Flies. All waste materials upon which flies commonly feed, except such as are being used to bait fly traps, must be destroyed, removed, or rendered inaccessible to flies. Food supplies must be protected from flies by suitable screening. Garbage and excreta must be carefully disposed of, and the access of flies to them prevented.

The Prevention of Breeding. Too much emphasis can not be placed upon the importance of removing from the vicinity of human habitations all material in which fly breeding takes place.

All possible breeding places of flies must be eliminated as such, particular attention being given to latrines, garbage, manure, and refuse from picket lines and stables.

Larvacides ordinarily should not be relied on, but may be necessary on soiled areas after material, such as manure, has been removed. Crude oil is efficacious in the treatment of soiled areas and will prevent the breeding of flies therein.

In warm regions the attack must be continued throughout the year. In temperate climates an energetic campaign should be begun before the onset of warm weather.

The Destruction of Adult Flies. Energetic measures must be taken to destroy adult flies. The campaign of destruction against adult flies should be carried out by means of traps, fly paper, fly poisons, and fly swatters.

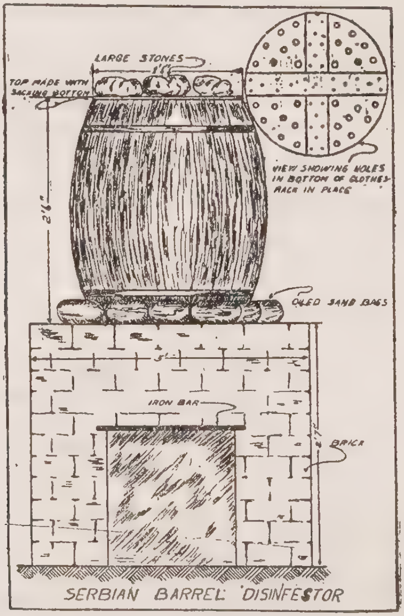

LARGE STONES
1'6"
TOP MADE WITH SACKING BOTTOM
VIEW SHOWING HOLES IN BOTTOM OF CLOTHES RACK IN PLACE
2'6"
OILED SAND BAGS
3'
IRON BAR
4'
BRICK
SERBIAN BARREL DISINFESTOR

Fig. 93.—Serbian Barrel Disinfestor.

Flytraps of authorized patterns and in ample numbers should be placed wherever flies congregate. The traps should be frequently baited. Fruit skins, particularly those of the banana, stale meat, stale fish, fermenting cereals, and sweetened water or molasses, slightly acidulated with vinegar, are excellent baits.

Fly paper should be placed in each mess room, bakery, kitchen, hospital ward, exchange, lavatory, pit latrine shelter, laboratory, and morgue, and in other places where flies congregate. It should be renewed when circumstances demand. The ribbon papers adapted for hanging are most satisfactory. Wires (Fig. 92) dipped in fly glue (equal parts by weight of castor oil and rosin) may be used in lieu of ribbon papers.

A formaldehyde fly poison may be used where practicable. This poison consists of a 3 per cent solution of a commercial formalin, properly sweetened or otherwise baited.

Fly swatters should be available for use at all times in each mess room and kitchen.

Protection Against Flies by Means of Screening. When practicable, hospitals, kitchens, bakeries, food storehouses, exchanges, lavatories, and latrine buildings should be protected against flies by the screening of all doors, windows, and other openings therein.

Lice. The kinds of lice which ordinarily infest man are the clothes or body louse (*Pediculus vestimenti,* also known as *Pediculus corporis*), the head louse (*Pediculus capitis*), and the pubic louse (*Phthirius pubis*). All of these lice and their eggs, or "nits," are visible to the naked eye.

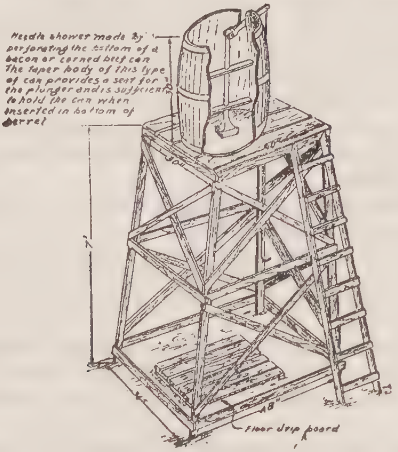

Needle shower made by perforating the bottom of a bacon or corned beef can The taper body of this type of can provides a seat for the plunger and is sufficient to hold the can when inserted in bottom of barrel
30"
40"
7'
48"
Floor drip board

Fig. 94.—Improvised Shower Bath.

Lice produce itching, discomfort, and disturbed rest in the persons whom they infest, and certain varieties (particularly the clothes louse) transmit the causative organisms of typhus and relapsing fevers, and probably that of "trench fever."

Clothes Lice. Clothes lice live and lay their eggs in the clothing, particularly along seams of both underclothing and outer clothing. They are rarely present on the *skin* except when feeding. The clothes louse is the most difficult kind to eliminate and the most important in the spread of disease. They readily pass from person to person when such persons sleep near each other. Their spread is favored in places where troops are crowded together, and have insufficient bathing and laundry facilities.

Clothes lice are frequently acquired during sexual intercourse with infested prostitutes.

The *elimination* of the clothes louse and its eggs may be accomplished by—1. Disinfesting the clothing, preferably by steam, or, in the absence of this agent, by hot air, or by careful pressing of the garments with hot irons, devoting special attention to the seams. Immersion in gasoline will destroy the adult lice but not the eggs.

In disinfesting the clothing and bedding of large bodies of troops portable steam sterilizers (on wheels) are used. Any container in which steam can be generated and retained will suffice. The "Serbian" barrel (Fig. 93) is a good example of an easily constructed and efficient type of disinfestor.

2. By maintaining a high standard of personal cleanliness through frequent and thorough bathing of the body.

Portable shower-bath sets of an up-to-date pattern accompany troops in the field, but when these are lacking, improvised "showers," of which Fig. 94 is an example, make satisfactory substitutes.

Head Lice. Head lice live and lay their eggs on the scalp and the hairs of the head, the eggs being firmly attached to the hairs.

The *elimination* of the head louse and its eggs may be accomplished by clipping the hair short, applying a solution of vinegar, followed by an application of kerosene to the scalp. The scalp should be thoroughly shampooed several hours later and a search made for eggs which may have escaped destruction.

Pubic Lice. Pubic lice live and lay their eggs on the skin and hairs of the body, particularly around the genitals.

The *elimination* of pubic lice and their eggs may be accomplished by shaving and bathing thoroughly the parts involved, followed by the application of a suitable disinfestant. A popular disinfestant is Blue ointment.

Bedbugs. (*Cimex lectularius*). It has not been definitely proven that bedbugs transmit the causative organisms of any diseases, though it is suspected that they have at times transmitted typhus, plague, and relapsing fever.

Bedbugs live and lay their eggs in the crevices and cracks of the floors and walls of infested buildings, in the joints and cracks of furniture and bedsteads, and in the seams and folds of infested mattresses and bedclothes.

They disturb the rest and comfort of occupants of infested places, and their continued presence in the habitations of man is an indication of a low standard of hygiene and sanitation.

Extermination. Rooms and houses infested with bedbugs can be disinfested by sulphur fumigation. Two pounds of sulphur should be burned for each 1,000 cubic feet of space, the room or house being kept closed so as to retain the vapor for at least 12 hours.

All crevices in walls, ceilings, and floors should be filled with mortar, cement, or putty to prevent bedbugs from obtaining protection therein.

Furniture and bedsteads harboring bedbugs should be disinfested by a liberal application of kerosene, after which they should be placed out in the sun for several hours. Mattresses and bedclothes should be disinfested as required for the extermination of lice.

Personal Hygiene. The general aspects of this subject have been dealt with under other headings, but it is necessary to cover some points here which have not been included elsewhere.

The first requisite for good health is cleanliness of person and clothing; the former is not usually difficult to obtain, but the latter often presents serious obstacles in the field.

The purpose of *clothing* is to protect the body from the vicissitudes of weather; from heat in summer, cold in winter, and from the chilling effects of rain and wind.

The fulfillment of these purposes depends upon the nature of the material, its texture, color, its heat-conducting and water-absorbing properties.

The materials of which clothing is made are wool, cotton, and linen.

Wool is a poor conductor of heat and a good absorber of moisture; hence it keeps in the heat of the body in winter and keeps out the heat of the sun in summer; by its property of absorbing and condensing moisture, thus setting free its latent heat, it prevents chilling of the body when one is perspiring after exertion; these properties render it suitable for undergarments in both summer and winter, and for outer garments in winter.

Cotton and *linen* are good conductors and poor absorbers of moisture, qualities which adapt them for use in outer garments in hot weather.

The *color* of outer garments has no influence on the temperature of the body except in the direct rays of the sun; black and dark colors absorb the direct sun's rays the most, while white and yellow reflect them most.

Besides color and material, *texture* has an important influence on the power of conducting heat; the more loosely woven a material is the more air there is in the texture, and as air is a very poor conductor, the warmer the material. Hence, the warmth of fur and feathers. Impervious material, such as rubber and to a less degree leather, keep out winds and are warm for that reason.

All soldiers, irrespective of the branch to which they belong, are taught the basic principles of personal hygiene. In addition to what is specifically included for medical soldiers, the following notes contain all the advice on this subject which is imparted generally throughout the service.

Simple Rules for Maintaining Health. Stay away from any person having a disease unless it is your duty to take care of him.

Be sure to use your mosquito bar when mosquitoes are present. See that it is well tucked in under the mattress and that it has no holes in it.

Flies and cockroaches frequently carry germs of disease and leave them on food and other articles over which they are walking. Get rid of flies in every way. Use flytraps, fly paper, and fly swatters. Be sure that flytraps are freshly baited daily. Whenever you see a fly in barracks, kill it. Be sure that screens in windows and doors are kept tightly closed at all times. Flies are attracted by slops, garbage, and manure. Garbage cans must be kept carefully covered and must be frequently cleaned. All food containers must be kept tightly closed. Scraps of food, fruit skins, and manure should never be left on the ground about the post nor in barracks or tents.

Water frequently contains dangerous germs. Do not drink any water unless you are sure it is pure. The water supplied you in a post is safe and can be drunk freely.

Drink plenty of water at intervals during the day, but do not drink a large amount at one time, especially when overheated after exertion.

Drink from your own glass or cup or from a bubbling fountain. Never use a cup which is used by others, as some one may have left live germs on it from his mouth or hands, and you may catch a disease when drinking from it. For the same reason do not exchange pipes, cigars, musical instruments played by the mouth, gas masks, handkerchiefs, towels, or shaving outfits.

Never eat or drink in a lunch room, restaurant, or at a soda fountain, unless you are certain the place is cleanly and approved by the sanitary authorities.

Bathe frequently at regular intervals, giving especial attention to the armpits, the parts between the legs, the feet, and under the foreskin. Always wash your hands thoroughly before eating, and after using the toilet, as you may have gotten some disease germs on your hands which will get on the food you eat and thus into your system. You are especially likely to get such germs on your hands when in the toilet.

Keep your mouth clean by thoroughly brushing your teeth on the inside and the outside once or twice each day, and before going to bed. Brush away from the gums toward the cutting surface of the teeth. This helps to prevent the teeth from decaying. Decayed teeth cause toothaches and require a large amount of dental care. They also lead one to swallow food without properly chewing it, and this results in stomach troubles. Food left between and around the teeth makes a good breeding place for germs. If your teeth are in poor condition consult a dental officer.

Take a sufficient length of time to eat your meals, chewing all food thoroughly. Hasty eating and swallowing half-chewed food lay the foundation for indigestion in later life.

Acquire the habit of having the bowels move regularly once each day, at as near the same time as possible. Always go to the toilet to urinate or when your bowels move. Urine and stools deposited on the ground in the vicinity of a camp or post are a great source of danger to all concerned. Flies or other insects alighting on the stools or on urine-soaked earth may pick up germs and later deposit them on food; or germs may be carried by rain or drainage into wells, or a stream which serves as the water supply for some city, or perhaps for your own camp or post.

Mattresses and bedding should be hung out in the sun for at least two hours once each week and oftener if possible. Sunlight kills disease germs quite promptly. Bedbugs should be watched for and, if discovered, carefully destroyed. If beds or barracks are extensively infested with bedbugs, the fact should be reported to the unit commander.

All squad rooms must be thoroughly ventilated, especially at night. Be absolutely certain that a sufficient supply of fresh air is always admitted to squad rooms during the night. All such rooms should be thoroughly aired daily.

Keep rooms clean. When sweeping them use something to prevent raising of dust.

Have your underwear, shirts, and socks washed frequently, and change them at least twice a week. Be on the lookout for body lice and crab lice. If you have a persistent itching on your body, or on your head, it is almost sure to be due to lice or the itch mite. Do not let itching go on; consult a medical officer at once.

When your clothing or shoes become wet, change them as soon as possible. Sitting around in wet clothes or with wet feet is almost certain to give you a "cold," or a worse disease.

Wear clothing of proper weight for the climate in which you are serving. Wear an overcoat when outdoors in cold weather. Your clothing should fit loosely.

Keep your hair cut short and wash it frequently. Keep your finger nails clean. It is especially important that cooks, bakers, and other persons handling food should have clean hands, short nails, and closely cropped hair.

Do not drink intoxicating liquor. Drinking men are more apt to get sick than others and less liable to get well when they do get sick. In addition, the liquor sold nowadays may contain poison, such as wood alcohol. A small amount of this can cause blindness or death, and many such cases occur every year. Moreover, alcoholism frequently leads to sexual indulgence.

Venereal Disease. Avoid venereal diseases. They constitute one of the greatest dangers to which the soldier is exposed. The venereal diseases are *gonorrhea* or clap, *syphilis* or pox (which usually begins with a chancre or "hard sore" on the penis) and *chancroids* or "soft sore." *Gonorrhea,* besides the immediate discomfort and inconvenience caused by it, is often followed by swollen testicle, stricture of the urethra, and stricture of the spermatic ducts so that the semen cannot escape, and the man becomes *sterile;* by a very severe form of rheumatism, inflammation of the bladder and kidneys, and occasionally septicemia and death. Getting a little of the gonorrheal pus into the eye from unclean fingers or towels produces a destructive inflammation, often resulting in blindness.

In *syphilis* the blood is infected, and while the disease is curable, one can never be certain that the cure is permanent.

The first stage is the chancre, the second the skin eruptions and the mucous patches, while in the third we have the terribly destructive affections of the bones, internal organs, nervous system, and blood-vessels. Sometimes the nose is eaten away or caves in, the palate is destroyed, the voice lost, and general paralysis, locomotor ataxia, and aneurism are among the later results These diseases are practically always caught by sexual intercourse with an infected woman. It is safe to say that nearly all regular prostitutes are infected with one or the other of these diseases, and that other women who permit sexual liberties from men and freely indulge in illicit intercourse are very likely to be. It is not a fact that the sexual act is necessary to keep up the health or powers of a man. The only certain protection against venereal disease is absolute avoidance of impure intercourse. This involves continence in the unmarried soldier. There is a widespread impression that continence is harmful to the young and vigorous man; nothing is further from the truth. Nature has provided nocturnal emissions for the discharge of an undue accumulation of seminal fluid, and their occasional occurrence does no harm. Sexual indulgence by young unmarried men is responsible for an immense amount of disease and suffering, not only among the men themselves, but also in later years among their wives, to whom they give the disease, although they may believe they have been cured, and among their children, to whom the malady may be transmitted even before birth. Select for female companions *decent* girls or women, and keep away from brothels, public dance halls, or "joints" of any kind, and the temptations which are bound to exist in such places.

Venereal Prophylaxis. If you have had illicit sexual intercourse, report at once to the designated place for "prophylaxis." This prophylactic treatment must be carried out thoroughly and the directions followed exactly. Do this as soon as possible, preferably within two hours after exposure. The sooner you report for prophylaxis after intercourse the more certain are you of avoiding disease.

Venereal prophylaxis is a form of treatment or local disinfection provided at all stations for the use of men who expose themselves to venereal disease, and regulations prescribe that men so exposing themselves without resorting to its use afterwards shall be tried by court-martial. The use of prophylaxis should be supervised by a trained attendant and consists of: (1) Urination; (2) thorough washing of the genitals with liquid soap and warm water; (3) washing with bichloride of mercury solution, 1-1000; (4) injection into the uretha of about a teaspoonful of a mild silver salt (2 percent protargol is satisfactory), not more than two days old. This should be retained for five minutes. (5) Drying of the parts and a thorough inunction of 30 percent calomel ointment into all parts of the external genitals. This is not to be rubbed off. (6) Wrapping the genitals in a paper napkin or similar soft paper (to prevent soiling of the clothing), and avoidance of urination for four hours.

In this sequence of treatments the urination and the protargol injection are especially for the prevention of gonorrhoea, the washing with soap and water and the bichloride solution for the prevention of chancroid, and the washing, the bichloride, and the calomel ointment, for the prevention of syphilis. (Ashburn).

If you do acquire venereal disease never try to treat yourself, and never go to an advertising quack doctor. As soon as you see any sign of such disease report to a medical officer and do exactly what he says. Any venereal disease can be cured much quicker if proper treatment is begun early. The advertising "specialists" are after your money, and "cure" is a secondary consideration.

Special Rules for Avoiding Disease During Field Service. All of the rules enumerated above are of the same importance in the field as in a post or cantonment. Indeed it is even more necessary to follow the instructions in detail when in camp, since the arrangements for keeping you in good health cannot be made as complete as in a permanent garrison. The following points are of particular importance in field service:

Be more careful of the water you drink. Do not drink any water until it has been passed as pure by a medical officer. When orders have been issued that all drinking water be boiled, be sure that the water you drink has *actually* been boiled, not merely heated some. When water has been chlorinated in a Lyster bag, drink only water from the bag. Drain it from the faucet into *your own* cup. Don't dip a cup into the bag, and don't drink by putting your lips on the faucet.

Be especially careful not to soil the ground with stools and urine. Always use the latrine, or the night urine can placed in the unit street.

Be sure that your mess kit and knife, fork, and spoon are thoroughly washed in *hot* soapy water and rinsed in *boiling* water after they are used. Unless this is done in *boiling* water your utensils may be contaminated with disease germs from the men who used the water before you did, and you may thereby contract disease.

Use a mosquito bar in regions where there are mosquitoes. Use same precautions about it that are given above.

Pay especial attention to bathing whenever possible. Be on the lookout for the presence of lice or other vermin on your body or on your clothes. Whenever they are found, report immediately to a medical officer.

Do not sit or lie directly on damp ground. When hot or perspiring, or when your clothes are damp, do not remain where a draft can strike you. If you do, you will become chilled and perhaps as a result will contract a disease like rheumatism, a "cold," or pneumonia.

Every day, if possible, hang your blankets and clothing out to air in the sun; shake or beat them with a stick. Germs and vermin don't like this treatment, and it will help to kill them or drive them out. They do like cool, damp, musty bedding or underclothes, and will grow and increase in such articles. Whenever possible roll up your tent so the air and sun can get in it. Keep it ventilated at night.

Wash your shirts, underwear, and socks frequently. Every opportunity should be taken to wash the underclothing; if very dirty it should be soaked for a while before scrubbing; woolen articles should be rinsed and scrubbed as little as possible, as such treatment renders them hard and causes shrinking. When water is not available the underclothing should be changed, dried in the sun, aired, and beaten. The danger of blood poisoning and lock-jaw from a wound is much greater if a bullet passes through dirty clothes.

Ditch your tent as soon as you can after it is put up, even if your camp is only for one night. If you do not, a little rain may spoil a whole night's rest.

Always prepare your bed before dark. If you have no cot, level off the ground and scrape out a little hollow for your hips. Get some straw or dry grass if possible. Green grass or branches from trees are better than nothing. Sleep on your slicker. This keeps the dampness from coming up from the ground and chilling your body.

Cooks in the field should use special care in warm weather to prevent food from spoiling, because ice and ice chests are usually lacking. Food or ptomaine poisoning, often a very serious and fatal illness to an entire organization, is due to eating articles, especially meat or fish, which have become spoiled. This illness is frequently caused by meat hash which has been prepared the day before it is to be used, and allowed to stand overnight in warm weather. Sausage is another common cause of this trouble. If there is any question as to the condition of any food product, it should be laid aside for inspection by a medical officer before being used. When called upon for duty at night, or early in the morning, a cup of hot coffee should be drunk. It is unsafe to eat heartily, or drink freely, when greatly fatigued or overheated. Ripe fruit may be eaten in moderation, but green or over-ripe fruit will give rise to bowel complaints.

Care of the Feet. One can not march with sore feet, and marching is the main part of a soldier's daily duty in the field. All soldiers should be familiar with the proper methods of caring for the feet. Sore feet are generally due to carelessness, neglect, or ignorance on the part of the soldier. The following matters should be given special attention:

The most important factor in the care of the feet, and the marching ability of the soldier, is the shoe. Civilian shoes, particularly tight, patent leather, or low shoes, are sure to cause injury and in time will ruin a man's foot. Only the marching shoes issued by the Quartermaster Corps should be worn, and they must be properly fitted to the individual. It will not suffice to order a marching shoe of the same size as one's ordinary civilian shoes, for it must be remembered that a soldier may have to march many miles daily over rough roads, carrying a heavy pack. The pack itself causes the foot to spread out to a larger size, and the rough roads give so much exercise to the muscles of the feet that they swell greatly through the increased blood supply.

Do not start out on a march wearing new shoes. This is a frequent cause of sore feet. Before beginning a march, new shoes should be properly "broken in" by wearing them for several hours daily for a week, and they should be adapted to the contours of the feet, if necessary, by stretching them with shoe stretchers having adjustable knobs, to take the pressure off painful corns and bunions. Such stretchers are issued by the Quartermaster Corps and there should be one or more pairs in every unit. If it is desired to waterproof shoes at any time a considerable amount of neat's foot oil or dubbin should be rubbed into the leather. Waterproof leather causes the feet of some men to perspire unduly, and keep them constantly soft.

Light woolen or heavy woolen socks should habitually be worn for marching; cotton socks should not be used unless specifically ordered by a medical officer. The socks need to be large enough to permit free movement of the toes, but not so loose as to permit of wrinkling. Darned socks or socks with holes in them are unfit for marching.

Until the feet have hardened they should be dusted with foot powder before each day's march; all squads are provided with this powder. Clean socks should be worn daily.

As soon as possible after reaching camp after a day of marching the feet should be washed with soap and water, and the soldier should put on a dry pair of socks and his extra pair of shoes. If the skin is tender or the feet perspire wash with warm salt water or alum water, but do not soak the feet a long time, as this, although very comforting at the time, tends to keep them soft. Should blisters appear on the feet, empty them by pricking at the lower edge with a pin which has been passed through the flame of a match, and cover them with zinc oxide plaster applied hot. This plaster is furnished to all units. If serious abrasions appear on the feet, or corns, bunions, and ingrowing nails cause trouble, consult a medical officer. Cut the toenails *square* (fairly close in the middle, but leaving the sides somewhat longer), as this prevents ingrowing nails.

In the Tropics. To guard against the special diseases of the tropics one of the most important general rules is to strictly avoid all native prepared foods and drinks; the method of their preparation is usually filthy in the extreme, and they are frequently infected with the germs of disease.

In many places it is a common practice to use night-soil as a method of fertilizing crops. For that reason it is extremely dangerous to eat lettuce, young onions, radishes, or any other vegetables which have not been thoroughly cooked. The safest rule is to eat only the food prepared in your own mess.

Native fruits, in good condition, neither unripe nor over-ripe, may be taken in moderation, but the outer skin should always be removed, or thoroughly washed in pure water.

The sun, in the heat of the day, should be avoided when possible, and when in the sun the back of the head and neck should be protected by a handkerchief or piece of muslin attached to the back of the cap or hat. The Japanese soldiers use such a flap, in two pieces, so as to allow free passage of air.

At night, and especially toward morning, chilling of the abdomen should be prevented by wearing a long undershirt or by throwing a blanket over the body.

A contagious skin disease known as *dhobie itch* is of frequent occurrence; it is usually due to uncleanliness and infected underwear. Besides treatment of the disease, it is necessary to boil the underwear to get rid of the infection.

CHAPTER XIV

FIRST AID

Introduction. One of the most important of the many duties of the medical soldier is to render first aid; in time of war it becomes his most important duty. In order that this duty shall be performed promptly and efficiently, and without excitement or hesitation, he must be taught what to do until he possesses the confidence born of knowledge. Self-reliance and resourcefulness must be keenly developed.

If called upon for assistance in an emergency under other conditions than those of an action his first duty is to send word to a medical officer; in action this often can not be done. The next step is to see that the sick or injured man is not crowded about so that he can not get air; then the nature of the case must be ascertained as quickly as possible. Remove any equipment the patient may have on, unbutton his collar, and loosen the clothing about his chest and abdomen. Look for bleeding; if it is at all profuse it must be stopped at once; if there is *shock* lower the head and give a little aromatic spirits of ammonia in water; if there is a wound protect it by a first-aid dressing, ripping up the clothing if necessary to get at it, but not attempting to clean or handle it in any way; if there is a fracture immobilize it before moving the patient, so that a simple fracture may not be made compound.

In action the amount of first aid to be rendered will depend on circumstances; sometimes the arrest of severe hemorrhage is all that can be attempted.

The clothing must be preserved as far as possible, for it is often impossible to replace it on the field, and it helps to provide the warmth necessary in warding off shock. Shoes are an aid in splinting the lower extremities. On reaching the hospital the clothing must be very gently removed.

Contusions. A *contusion* or *bruise* is a subcutaneous or closed injury; a laceration of the deeper tissues without a division of the skin. Contusions vary in extent from an ordinary "black and blue" spot, to the almost complete pulpification of a limb, with laceration of the blood-vessels and nerves, such as sometimes occurs in railway or other accidents. The first evidence of contusion is usually rapid swelling of the part; every one knows that when one is struck a hard blow on the eye the swelling closes it almost immediately, or a blow on the head is promptly followed by a "bump". There is only one thing which could cause such rapid swelling, and that is bleeding caused by the laceration of the subcutaneous tissues and vessels, the blood not being able to escape.

At first there is no discoloration, but after a few hours or a day, the blood makes its way toward the surface, and the part looks black and blue and, as changes later take place in the blood, greenish or yellow. Another symptom is pain. If the injury is severe there is *shock;* the more shock the less pain usually. For symptoms and treatment of Shock see below.

For the treatment of the contusion itself the indication is to stop the subcutaneous bleeding, this can be done by very hot or very cold applications; if the injury is in a limb, firm, even pressure of a bandage may be effective. Later, when the bleeding has ceased, the absorption of the extravasated blood may be hastened by hot fomentations and massage.

Wounds. A *wound* is a division not only of the tissues but of the overlying skin. Wounds are classed as *incised, lacerated, contused, punctured,* and *poisoned; gunshot wounds* are usually considered in a class by themselves.

An *incised wound* is one made with a sharp cutting instrument, the class of wounds commonly known as *cuts,* such as cuts with a razor or knife.

A *lacerated wound* is a *torn* wound, such as is made by barbed wire or a piece of shell; it does not differ practically from a *contused* or *bruised* wound made with a blunt instrument, such as a club or stick.

A *punctured wound* is deep and narrow; stabs are punctured wounds.

A *poisoned wound* is one in which some poison has been introduced by the same agent which made the wound; any of the above-named classes of wounds may be poisoned.

Gunshot wounds are both punctured and contused; they may also be lacerated.

Incised wounds are especially apt to be attended by bleeding; lacerated and contused wounds are less apt to give rise to dangerous hemorrhage because the vessels are torn and twisted; a limb may even be entirely torn off without serious bleeding, but shock in this class of wounds is apt to be severe.

Punctured wounds are dangerous because, while the external opening may be small, they often penetrate so deeply as to seriously injure important organs, or cause internal hemorrhage.

The immediate dangers of wounds are hemorrhage and shock; if these are removed the one great danger is *infection;* if that can be prevented the most serious wounds may be recovered from, unless, of course, there is irreparable injury to some important organ.

The healing of wounds takes place in two ways; if there is no infection and no loss of tissue and the parts are brought into proper apposition, healing occurs by *first intention;* otherwise by *granulation,* with or without *suppuration.*

Most incised and small-arm bullet wounds are originally aseptic, or germ free, and if kept so will heal or grow together without heat, redness, severe pain, or swelling, and without fever.

If the wound becomes infected with pus cocci, *inflammation* occurs with its attendant symptoms of heat, redness, pain and swelling, and usually more or less fever; suppuration follows, and if the pus cannot escape freely some of the poisons produced by the growth of the pus cocci are absorbed, *septic toxemia,* or the cocci themselves get into the blood-vessels, *septic infection;* the septic infection may result in the formation of abscesses in the different parts of the body, *pyemia.* All these blood poisonings are attended by chills, or chilly feelings, fever, headache, a peculiar waxy appearance of the skin, and perhaps delirium and stupor. Unless arrested the process terminates in death.

Poisoned wounds may be divided into those in which the poison is chemical, including the bites and stings of insects, scorpions, tarantulas, centipedes, and snakes; and those in which it is bacterial, including the bites of man and other animals, not rabid, the bites of rabid animals, and wounds infected with *tetanus* or *anthrax.*

The bites and stings of insects cause considerable smarting, and if in loose tissues, often much swelling; relief may be afforded by the application of ammonia, soda, or even wood-ashes; the sting if left in the wound should be extracted. *The bites of the tarantula and centipede* and the sting of the *scorpion* may cause great pain, considerable shock, and much local swelling and inflammation, but are seldom if ever fatal. The treatment is the same as for the bites of other insects, but in very severe cases it may be necessary to incise the wound and suck out the poison. Stimulants may be given if necessary, and morphine for the pain.

When a person is *bitten by a poisonous snake,* of which the rattlesnake and copperhead are the principal varieties in this country, prompt action is required.

If the wound is in the extremity: 1. First apply a tourniquet to prevent passage of the poison into the system. A tourniquet should be applied to the upper arm or to the thigh only; every half-hour it is loosened to permit flow of blood and a little of the poison to enter the system, and then tightened again. 2. Make a cross-cut over the bite with a knife, about ¼ inch deep. A free bleeding works out the poison. With a hypodermic syringe inject potassium permanganate 1 to 3000 solution around the wound, putting the needle in half an inch deep. Then apply a wet dressing of the potassium permanganate solution. If the wound occurs on the head or trunk, where a tourniquet cannot be used, a slightly stronger solution of potassium permanganate should be used in the same manner as outlined above. Some authorities countenance sucking the poison from the wound.

In all cases of snake bite, patients should be kept absolutely quiet. Warmth should be applied to the body, and cardiac stimulants given.

Whisky has little if any value, popular opinion notwithstanding. Good results have been reported from the use of an antivenom serum. Recent experience has shown that suction with a breast pump, or similar apparatus, removes venom even a number of hours after the bite.

The bites of man and other animals not rabid are always more or less poisonous, from the presence of the bacteria constantly found in the mouth and on the teeth; sometimes they are fatal; such wounds should be thoroughly disinfected and wet antiseptic dressings applied.

Rabies or *hypdrophobia* is a very fatal disease caused by the bite of a rabid animal, or "mad dog." The effect is not immediate like that of snake bite, but may be delayed weeks or months.

The treatment of the *bite* is thorough cauterization, followed by wet antiseptic dressings, and the early institution of Pasteur prophylaxis.

Tetanus or *lock-jaw* is a disease the result of a wound infected by the bacillus of tetanus. It is especially apt to occur after toy-pistol or shotgun wounds, or any wound in which dirt has been carried deeply into the tissues. It has been very common in wars where the fighting occurs in trenches made in cultivated fields which have been enriched with stable manure.

The tetanus germ grows best in the absence of air; hence it thrives in deep, punctured wounds. The germs are found in the soil especially about gardens, stables, and in the streets. Wounds of such a character should be opened up freely, disinfected, and drained, and antitetanic serum administered subcutaneously.

Anthrax or *malignant pustule* is sometimes caused by the bite of an infected fly. It starts as a very hard swelling like a carbuncle, often on the lip. If its nature is recognized it should be at once excised.

In warfare with savage peoples the latter may use *poisoned weapons*, especially arrows. Many different poisons are used; vegetable, animal, and bacterial.

The local treatment is the same as that of snake bite; the general treatment must be symptomatic, unless the nature of the poison is known.

World War experience, with its constant trench fighting, showed that under the new conditions many wounds, especially those caused by shrapnel, shell, and hand grenades, are primarily infected, and not only with the bacteria of suppuration, but often with those of gas-gangrene and tetanus. If infected with the germs of gas-gangrene, the wound quickly becomes foul and sloughing, and full of gas, so that it crackles under pressure.

First Aid Treatment. The first-aid treatment of wounds consists in the arrest of hemorrhage— and by hemorrhage must be understood serious bleeding, and not the moderate bleeding which accompanies most wounds and only requires the pressure of a dressing—the relief of shock, and the prevention of infection. It is a good practice to splint all large flesh wounds the same as you would a fracture.

To prevent infection is all-important, and may be accomplished by following a few simple rules: do not touch the wound with the fingers or anything else; do not attempt to wash it or remove particles of dirt or clothing; if the intestine is protruding do not attempt to replace it; if the sharp end of a broken bone is sticking through leave it undisturbed; remove the soiled and bloody clothing about the wound, paint the wound and surrounding skin with tincture of iodine, allow it to dry, and apply the contents of the first-aid dressing, so handling it as not to touch with the fingers any part of the dressing to be applied next to the wound.

First Aid Dressings. All persons in the field are issued a first-aid *packet* for their individual use. As this item of equipment is so carried on the person as to need protection from hard "knocks," the first aid *packet* comes in a hermetically sealed metal cover which fits snugly into the canvas pouch provided as a carrier. The small first-aid *dressing* carried in Medical Department kits and chests has identically the same contents as the packet, but is put up in a waxed card-board instead of a metal container. A piece of strong twine is embedded in the card-board container in such fashion as to break the seal and facilitate opening when pulled.

The Packet. The first-aid packet now (1927) in the hands of troops and stocked in large quantities in our depots will be replaced by a new pattern (Fig. 95), when the existing supply is exhausted and we again go into production.

The old-pattern first-aid packet contains two compresses of absorbent sublimated gauze, each sewed to the center of a sublimated gauze bandage, and two safety pins. Each bandage and the safety pins are wrapped in parchment or waxed paper.

The official directions for applying this *old-pattern* first-aid packet are as follows:

1. If there is only one wound, carefully remove the paper from one of the two packages, without unfolding compress or bandage, and hold by grasping the outside rolls of bandage between the thumb and fingers. When ready to dress wound, open compress by pulling on the two rolls, being careful not to touch the inside of the compress with fingers or anything else. Still holding one roll of the bandage in each hand, apply the compress to the wound, then wrap the bandage around the limb or part and tie the ends together, or fasten with safety pins. The second compress and bandage may be applied over the first, or it may be used as a sling if the arm is wounded, or to bind both legs together if one is injured.

2. If there are two wounds opposite each other, apply to one wound a compress with unrolled bandage, and hold it in place by the bandage of the compress used to cover the other wound.

3. If there are two wounds not opposite each other tie a compress over each.

4. If the wound is too large to be covered by the compress, find and break the stitch holding the compress together, unfold it, and apply as directed above.

5. Be careful not to touch the wound with your fingers nor handle it in any way, for the dirt on your hands is harmful, and you must disturb a wound as little as possible. Never wash the wound except under the

orders of a medical officer. The bandaging will stop ordinary bleeding. Generally, this is all that is necessary for the first treatment, and sometimes it is all that is needed for several days. The importance of the care with which this first dressing is made can not be too seriously insisted upon. It is better to leave a wound undressed than to dress it carelessly or ignorantly, so that the dressing must soon be removed.

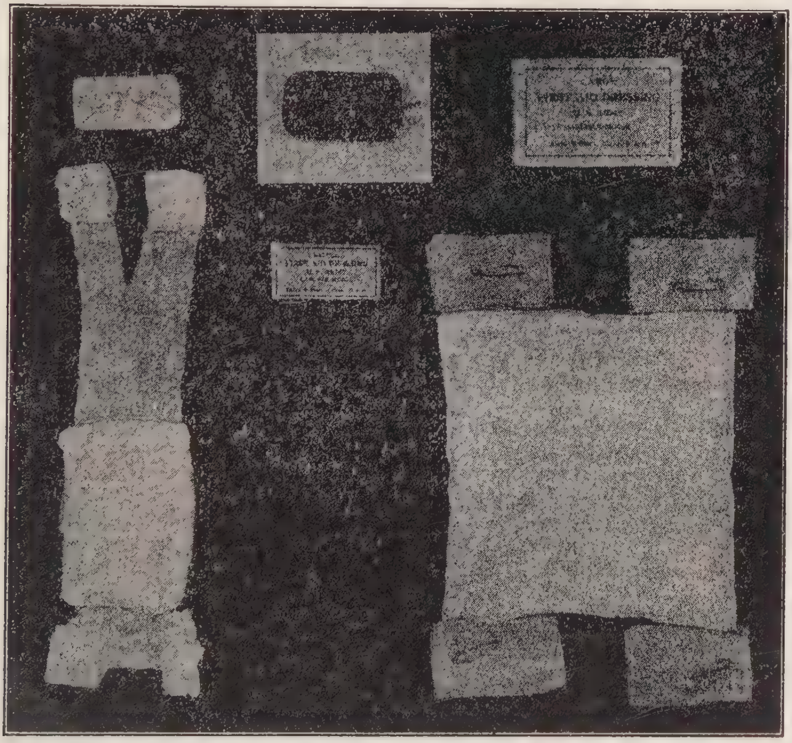


Fig. 95.—First Aid Dressing, Large and Small. New pattern. Metal covered packet (small dressing inside) in upper center.

6. Always remember that if the contents of one packet is not large enough to cover a wound thoroughly, you should use several packages, or enough to insure that the wound is well covered and protected.
7. Be careful to keep your fingers out of the wound.
8. Make no attempt to clean the wound—simply cover it with a dressing and bandage.

The *new-pattern* first-aid packet (Carlisle model, Fig. 95) is much simpler. Its metal container has the same dimensions as the old pattern, but is sealed after an improved method which greatly facilitates opening when the dressing is needed. The dressing consists of a *single* gauze covered cotton pad 5 inches wide by 7 inches long, made up of a combination of absorbent and non-absorbent cotton, stitched firmly over both ends to the middle of a 2 yard piece of 4½ inch bleached bandage gauze; the latter being split towards the middle to within 6 inches of the pad, into 2 equal tails. The bandage and tails are rolled behind the pad and then the entire dressing is wrapped in germ proof paper and compressed so as to fit into the container. Slipped between the bandage and the non-absorbent outer side of the pad is a piece of bright red paper, 4 inches square, bearing the printed legend in heavy face type "Put other side next to wound," the printed side being placed next to the bandage so as to make the letters visible through its meshes. Stamped in large raised letters on the outside of the metal container, for the information of the uninstructed, is the following:

FIRST AID PACKET, U. S. ARMY
CARLISLE MODEL
(TO OPEN PULL TAPE)
RED PAPER INDICATES BACK OF DRESSING
PUT OTHER SIDE NEXT TO WOUND
(NAME OF MANUFACTURER)

Large Dressing. To protect the extensive wounds often caused by shell-fire, and even small-arms at close range, the ordinary first-aid packet or small wound dressing is not large enough; therefore to meet this need a dressing now known as the "First-Aid Dressing, Large" (Fig. 95) and formerly as the "Shell-wound Dressing" is furnished for use in Medical Department kits and chests.

In the *new pattern* Carlisle Model (Fig. 95) this large dressing is put up in a sealed cardboard container of the same material as the small, and consists of a gauze covered pad of absorbent cotton with an unbleached muslin back, to which are sewn four muslin bandages,each with a safety pin attached. The pad is thick and nearly 12 inches square. Its edges are stitched securely to the muslin back. Included in this stitching are the ends of four 2½ inch muslin bandages, 48 inches long. These bandages are folded, and for packing purposes held in that position by the safety pins supplied for use in securing the dressing when applied. The entire dressing is compressed so as to fit the container, the dimensions of which are 6 x 3⅝ x 1⅝ inches.

Some of the old "shell-wound" dressings and the Red Cross "front-line" dressings left over from the World War are still on hand and serve satisfactorily. They provide the same kind of large pad found in the Carlisle Model, with some accessories not in the latter, and on the whole take up more space in packing.

Just a word of caution regarding the use of the large dressings. Upon going into action the medical soldier expands his kit pouch into the emergency position and loads up with a reasonable supply of these dressings. If using the old H. C. belt he carries them in an improvised bandoleer. He always has an ample supply of the small dressings. In rendering first-aid there is a tendency on the part of many to use a large dressing when a small one would suffice, thus quickly expending the limited supply of the former.

Later on, as a consequence of this prodigal use, there are no large dressings available at the very time perhaps when one is badly needed. Conserve your large dressings! Whenever practicable use the smaller type instead.

If a standard type of first-aid dressing is not at hand, the dressing may be of ordinary sterilized gauze, or any other thoroughly clean material, dry if possible; firmly secured by a suitable bandage.

Hemorrhages. In *capillary hemorrhage* there is a steady oozing of red blood from all over the wounded surface; nature's method of arresting such a hemorrhage is by the coagulation or clotting of the blood in the mouths of the tiny vessels, and by the contraction of their cut ends. In treatment we imitate nature. The part should be elevated and very hot or very cold water applied to the wound; the effect of either one is the same as the other, the result being the contraction of the vessels, coagulation of the blood, and arrest of hemorrhage.

After this, uniform pressure applied to the wound, by means of a gauze compress and bandage, is all that is required.

Epistaxis or *nose-bleed* is a form of capillary hemorrhage which is sometimes difficult to control; the arms should be held by an assistant vertically above the head, and a sponge dipped in cold water applied to the back of the neck between the shoulders, and another over the root of the nose; very cold or very hot water should be snuffed up the nose; if this fails an astringent should be added to the water—alum or tannic acid. Should the bleeding still continue, plug the nostrils with absorbent cotton; but if the blood then runs into the throat from the back of the nose, the assistance of a surgeon will be required.

Capillary bleeding from a tooth socket is sometimes excessive; plug the cavity with a narrow strip of gauze, place a compress over the gauze, and bandage the lower jaw firmly against the upper.

Venous. In *venous hemorrhage* there is a rapid flow of dark blood, a welling up as it were, without any spurting. In the treatment the first step is to elevate the part; so little velocity is there in the venous current that elevation alone will often stop the bleeding; if if does not, pressure must be made directly over the wound, and hot or cold water may be applied if necessary; if in an extremity, the limb should be bandaged from the toes or fingers up to the bleeding point, in addition to the pressure over the point.

Arterial. In *arterial hemorrhage* the blood is bright red in color and escapes in jets. Nature's method of arresting such a hemorrhage is by the formation of a clot, the contraction of the muscular coat of the artery lessening the caliber. and the retraction of the middle and inner coats affording an obstacle to the escape of the blood and favoring clot formation, and the diminished force of the blood flow caused by the weakening of the heart's action, the result of the hemorrhage.

When fainting follows the loss of blood, the hemorrhage often ceases at once because the heart's action is so weak that it cannot force out the clot which forms in the mouth of the vessel; in such a case, however, the bleeding is apt to start again when reaction takes place, or when some sudden movement displaces the clot. The recurrence of bleeding with reaction is known as *intermediate hemorrhage* to distinguish it from *primary hemorrhage,* that which occurs immediately on receipt of the wound, and *secondary,* that which occurs at a still later period from the reopening of the artery by the slipping of a ligature, or from an extension of sloughing, or ulceration, of the vessel.

In the *treatment of arterial hemorrhage* prompt action is required; bleeding from a large artery like the femoral may cause death in a minute or two; as a matter of fact a large proportion of the deaths on the battlefield are due to hemorrhage.

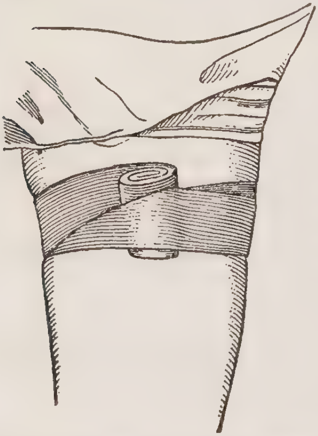


Fig. 96.—Compression of the Femorral Artery by a Rubber Bandage.

The thing to be done is to compress the artery between the wound and the heart, or if that cannot be done, then in the wound itself; the point selected for pressure should be where the artery crosses a bone because there it can be made most effective. If a hose connected with a hydrant breaks, we stop the flow of water by putting a foot upon the hose between the broken part and the hydrant; we apply the same principle in arterial hemorrhage. The pressure should be made with the fingers, preferably the thumb, and should be firm enough to arrest the bleeding; it should be made over the clothes, as too much time may be lost in removing them. You will know that you are pressing on the right place by feeling the artery beating beneath the fingers, and by the arrest of the bleeding point. As pressure with the fingers soon becomes tiresome, get an assistant to slip his thumb over yours, and take your place while you prepare a *tourniquet.* The principle of all tourniquets is a pad over the artery, to bring the pressure on the artery and take it off the veins, a band around the limb and over the pad, and some means of tightening the band. There are a number of special tourniquets; for field use we provide a Robinson type, which is much like an ordinary web belt, but has an ingenious kind of buckle for holding the webbing at any point. If one of these is not at hand a suitable one must be improvised; an excellent tourniquet may be improvised with a rubber bandage; a number of turns are made about the limb and the rolled portion of the bandage then placed under the last turn in such a position as to press directly upon the artery (Fig. 96). The most common improvised tourniquet is the *Spanish windlass;* in this arrangement any rounded, smooth, hard object, such as a stone, a cork, or a roller bandage, is used as a compress; for the band a handkerchief, a suspender, a waistbelt, a bandage, or anything of the sort may be used; to tighten up the band a stick or bayonet-scabbard or somethnig of the kind is passed under the band and twisted until the bleeding ceases, when the ends of the stick are tied to the limb to prevent the band from becoming untwisted (Fig. 97). A tourniquet applied tight enough to stop arterial hemorrhage causes pain and swelling of the limb, and if left long enough may cause gangrene of the part; it should therefore be watched and loosened up from time to time, say every half-hour or so. If on loosening the tourniquet the bleeding starts again tighten it up; if there is no appearance of bleeding leave the loose tourniquet in place, with an attendant watching to tighten it up should the hemorrhage recur.

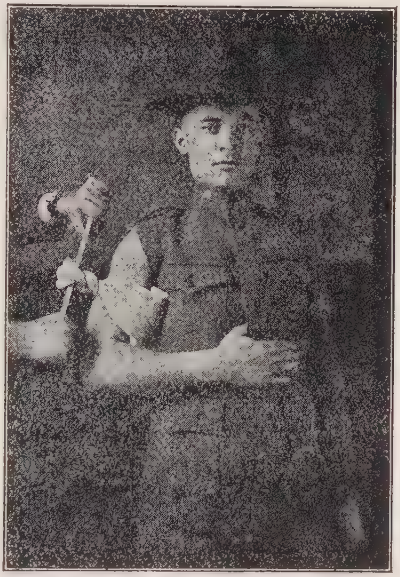


Fig. 97.—Extemporized Tourniquet (Spanish Windlass) applied on the Brachial Artery.

The surgeon arrests the hemorrhage permanently by tying or twisting the divided ends of the artery.

Precautions to be observed in the application of a tourniquet:

1. Never cover over or bandage a tourniquet. 2. Write plainly on the emergency medical tag the word *"tourniquet."* 3. If the injured man is conscious, he should be instructed to tell every medical officer with whom he comes in contact that he has a tourniquet on. 4. Lastly, remember, if a tourniquet is left on a wound for six hours the limb will surely die.

Compression of Arteries. Fig. 98 shows on the skeleton the points at which the various arteries may be compressed to the best advantage.

For bleeding anywhere in the upper extremity below the middle of the arm compress the brachial artery at the point shown in Fig. 98 and then apply a tourniquet a little higher up. If the wound is low down in the palm of the hand, it may not be desirable to arrest the circulation in the entire limb, in which case the pressure may be made in the palm, by a roller bandage over which the fingers are doubled and tied in place with a bandage.

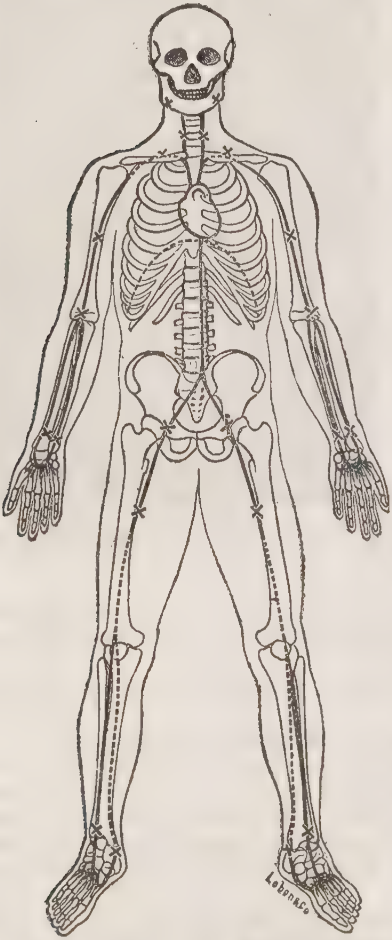


FIG. 98.—Skelton with Black and Dotted Lines Showing the Course of the Arteries and a x Indicating the Pressure Points.

If the wound is in the axilla, pressure must be made on the subclavian artery against the first rib and in the hollow behind the clavicle (Fig. 98) ; as a tourniquet cannot be applied here, the fingers may be relieved by making the pressure with the handle of a large key, or the end of a pocket knife, well wrapped.

In *bleeding from any part of the lower extremity* compress the femoral artery against the head of the femur just below the middle of the groin, with both thumbs, at the point shown in Fig. 98, then apply a tourniquet to replace the thumbs.

If the *bleeding is from the foot* another method is to put a pad behind the knee and flexing the leg forcibly, tie the leg to the thigh; if from the top of the foot a tourniquet may be placed over the anterior tibial artery in front of the ankle, or if from the sole of the foot over the posterior tibial behind the inner ankle.

Hemorrhage of the neck, from the branches of the carotid, is controlled by compression of the carotid with the thumb against the vertebræ (Fig. 98) ; a tourniquet cannot be applied here.

Bleeding from the tongue may be controlled in the same way, or by rinsing out the mouth with ice water, or holding pieces of ice in the mouth.

Bleeding from the lips may be very severe; it is controlled by grasping the lip between the thumb and fingers; as the arteries of the lip come from both sides, pressure must be made on both sides of the wound.

Bleeding from the face may be arrested by pressure on the facial artery in front of the angle of the jaw. (Fig. 98).

Bleeding from the scalp is easily arrested by pressure with a compress on the bleeding point, the pressure being made by a knotted bandage as shown in Fig. 99.

From Lungs or Stomach. In *bleeding from the lungs* the blood is bright red, frothy, perhaps mixed with mucus, and is coughed up. Listen over the chest, and where rattling is heard, apply an ice bag; give the patient pieces of ice to swallow, and keep him perfectly quiet in the recumbent position; he should neither talk nor move.

In *bleeding from the stomach* the blood is vomited, is usually dark in color, and may be mixed with food. It is always well to remember that vomited blood does not necessarily indicate hemorrhage from the stomach; the blood may have been swallowed, coming from the back of the nose or throat; inquire whether there has been any nosebleed. The treatment is the same as for hemorrhage from the lungs, except that the ice bag is applied over the stomach.

In *bleeding from the bowels* the blood is bright red if fresh; black and tarry if old. All that can be done is to apply cold applications to the abdomen and keep the patient quiet, until he can be seen by a surgeon.

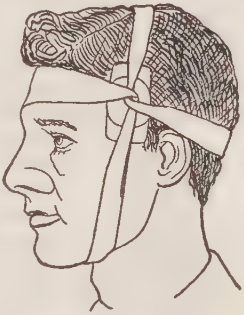


Fig. 99.—Compression of the Temporal Artery by Knotted Bandage.

Fractures. A *fracture* is a *broken bone.* There are two great classes of fractures, simple or closed, and compound or open.

A *compound* or *open fracture* is one in which there is a wound communicating with the broken ends of the bone; the broken bones are open to infection. A *simple* or *closed fracture* is one in which the broken bones are closed to the air and to infection, in that there is no wound communicating with the fracture.

A fracture is *comminuted* when the bone is broken into more than two pieces; *complicated* when there are also injuries to the adjoining vessels, nerves, or muscles; *impacted* when the broken ends are driven into each other so that they can not move; *green stick* when the bone is bent and only partially broken, as a green stick is broken. (Fig. 100).

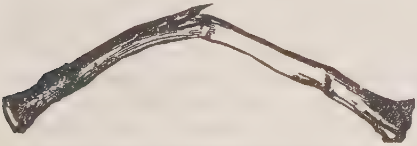


Fig. 100.—Green-stick Fracture.

Fractures are caused by *direct violence,* as when a wagon wheel passes over a limb and breaks it; *indirect violence,* as when a man falls on his hand and breaks his collar bone; *muscular action,* as when one breaks his arm throwing a ball.

Signs. How will you know that a fracture has occurred? First there is a loss of power in the part; if the leg is broken the man has fallen and can not get up; if it is the arm he can not use it. Then the limb is in an unnatural position; if you compare it with the uninjured limb you will see that there is a deformity between the joints, and that the injured limb is probably shorter. If you attempt to move the limb you find there is *movement between* the joints where there should be none, and you can both feel and hear the broken ends of the bone grating together—*crepitus.*

The patient complains of great pain and tenderness at the seat of fracture, and there is swelling there due to bleeding from the broken ends. There is a history of violence, and often the patient will say that he heard the bone crack and give way.

In the treatment of fractures the great point is to keep them from becoming open; a closed fracture is a very simple matter, not dangerous to life, and usually healing promptly if kept quiet in proper position; an open fracture is quite another matter, always taking a long time to heal, and often threatening loss of limb and even life from infection.

Therefore never attempt to move a man with a fracture until the fracture has been fixed so that the broken ends of the bone can not move. If a medical officer can be obtained at once merely make the patient comfortable with pillows and supports where he lies; if he must be moved apply splints, handling the broken bones very carefully so that sharp ends may not come through the skin and make the fracture compound.

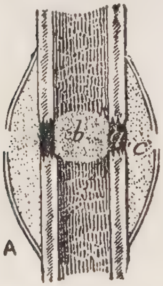


Fig. 101.—Union of Fracture.

The cause of deformity in fractures is muscular contraction, and this contraction must be overcome in *setting* the fracture, which is merely getting the broken ends into proper position; this is done by traction or *extension* and *counter-extension;* extension is pulling the far end of the limb, and counter-extension is merely holding the end next the trunk; pull until the deformity and shortening disappear and the two limbs look alike, then hold them so while the splints are being applied.

When a fracture is properly set the blood which escaped into the tissues about the break is gradually absorbed, and at the end of a week or ten days *callus* is thrown out and the bone begins to *knit;* callus is a soft, cement-like substance which is poured out between the broken ends, around them, and in the medullary cavity; the callus gradually hardens into bone. That which is around the break forming a sort of ferrule or splice, and that in the medulla forming a pin, are absorbed after many months; but that between the bones remains permanently, knitting the bone together (Fig. 101). Sometimes the callus is not sufficient in quantity or quality, and *union* fails to take place.

General Instructions for the First-Aid Treatment of Fractures. 1. The patient should not be moved; the person who is to render first-aid should go to the patient. Unnecessary handling of the fractured part should be avoided, every effort being made to prevent any additional injury. Procedures to demonstrate crepitation are unnecessarily painful and may be harmful. In the field, clothing should not be removed unless necessary for examination and splinting.

2. In compound fractures clothing should be cut away, the wound painted with iodine, and the first-aid dressing applied.

3. Correct deformity by traction. The immobilization of fractures of the humerus and the femur, as well as many other fractures, always depends on traction (extension and counter-extension).

4. While a differential diagnosis between dislocation and fracture must be made since the treatment differs, it is safest to apply splints in all cases where doubt exists and there seems to be a probable fracture.

5. *"Splint them where they lie."* The splint is taken to the patient and not the patient to the splint.

6. Treat shock and hemorrhage, if present.

7. Use extreme care in transporting the patient, both by litter and ambulance.

8. As a general rule, antitetanic serum, 1500 units, should be administered in all compound fractures as early as possible.

Skull. Fractures of the *skull* and *spinal column* are chiefly of importance on account of the coincident injury to the important parts of the nervous system which lie immediately beneath the bone. In fractures of the skull, unless compound or depressed, all the usual symptoms of fracture are absent, or entirely overshadowed by the injury to the brain. The most prominent brain symptoms are loss of consciousness, and paralysis; if the loss of consciousness is sudden it is probably due to the pressure of a piece of bone; if it comes on slowly it is apt to be the result of hemorrhage from a torn vessel. *In fractures of the base of the skull* there may be bleeding from the nose or ears, or into the orbits and under the conjunctiva; the escape of cerebro-spinal fluid—a clear, watery serum—from the ears is considered a sure sign of fracture of the base.

Treatment: Keep the patient quiet, in a recumbent position, and apply an ice bag to the head; if the fracture is compound a dressing will be required.

Spine. In fractures of the *spinal column* the spinal cord is generally injured or cut across, with resulting paralysis of all parts below the fracture. On examination, irregularity of the spinous processes will be noted, usually with angular deformity. Handle the patient with great care so as not to produce or increase injury to the spinal cord. Before moving him apply splints on both sides, from his armpits to his feet, so as to make the body as rigid as possible, then work a blanket under him, and drawing it as tight as possible, on it lift him to the litter.

Ribs. *Fractures of the ribs* and *pelvis* are also chiefly important on account of the injury to the contained viscera.

In *fracture of the ribs* the sharp end of the bone is apt to stick into the lung every time the patient breathes; hence in these cases the patient will often complain of a sharp pain when he breathes, and there may be cough, with spitting of frothy blood. When the fingers are passed firmly along the ribs they may be felt to give at the broken point, which is also very tender.

The treatment consists in confining the movements of that side of the chest as much as possible, in order to give the broken bone an opportunity to rest and *knit.* This is done by circular bandaging of the whole chest or by strapping one side.

Pelvis. The *pelvis* is so strong that the bones are broken only by the most severe direct violence, as when a heavy wagon passes over it. The symptoms are inability to stand or sit up, and crepitus may be felt when firm pressure is made. If there is an injury to the bladder the urine contains blood. Fractures of the pelvis should be supported by a swathe pinned tightly about it to afford support; splints may also be applied on both sides from the axillae to the feet.

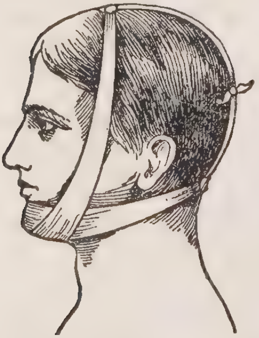


FIG. 102.—Four-tail Bandage for Fracture of the Jaw.

Face. In *fracture of the nasal bones* there is usually considerable deformity, the bridge of the nose being caved in and pushed to one side; crepitus is generally to be felt, and there is considerable nose-bleed.

Check the bleeding by syringing with hot or cold water; push the bones into place by means of a probe, or slender and smooth stick in the nostril, aided by the fingers outside. Apply cold dressings over the bridge of the nose, and warn the patient not to attempt to blow the nose.

In *fracture of the lower jaw* the line of teeth is irregular, and there may be bleeding from the mouth; the patient can not open his mouth, and the fracture can usually be readily felt.

Push the bones into place and apply a four-tailed bandage (Fig. 102) or two narrow cravats. The patient can not chew, and will have to live for a time on liquid foods taken through a tube.

Upper Extremity. In *fracture of the clavicle* the attitude of the patient is often characteristic; the shoulder drops downward, inward and forward, and he attempts to support it by holding the elbow of the injured side in the hand of the sound side. The collar bone lying immediately under the skin, the fracture is easily made out.

As a first-aid dressing, put the arm in a large sling, place a pad in the axilla, and bind the arm to the side. The fracture is put up permanently in a *Sayre's dressing* or a *Velpeau bandage.*

Fracture of the humerus or *arm bone* has all the common signs of fracture and may ordinarily be recognized without difficulty. The Thomas arm splint, or suitable substitute, should be applied as described below.

When *both bones of the forearm are broken,* all the usual signs of fracture are present; wooden splints, or the Thomas arm splint, should be applied. See below.

Fracture of the radius alone, just above the wrist, is very common and is known as *Colles's fracture.* It is attended by a peculiar silver-fork deformity (Fig. 103), and as the bones are usually impacted, crepitus is absent. The setting of this fracture can only be properly done by a surgeon; meantime the arm should be placed in a sling.

Fracture of the metacarpals—a broken hand—usually occurs in a fight. The most prominent signs are deformity and pain. Splints should be applied on the back and front of the hand, reaching from the finger tips half-way up the forearm.

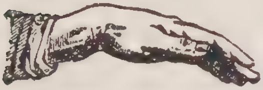


Fig. 103.—Colles's Fracture.

Fractures of the fingers are treated by the application of narrow finger splints, usually on the palmar surface only.

Lower Extremity. In *fractures of the femur* all the common symptoms of fracture are usually present; the foot may be everted, lying on its outer side, and the limb is shorter than the other. The Thomas Leg Splint, or suitable substitute, should be applied as described below.

In *fractures of the patella* or *knee-cap* the patient can not stand or walk; the upper fragment is drawn up on the thigh by the powerful muscles attached to it, and the gap can be readily felt. The joint swells up at once. A Cabot Posterior Wire Splint, or suitable substitute, should be applied as described below.

If *both bones of the leg are broken* the fracture is very apt to be compound, because fracture of the tibia is usually oblique with a sharp point that may come through the skin; such a fracture should be handled with the greatest care. Apply a Thomas Leg Splint, or suitable substitute.

Fracture of the fibula alone, just above the ankle, is called *Pott's fracture;* the signs are usually indistinct, but if the lower end of the tibia is fractured as well, there is apt to be marked eversion of the foot. Apply a Cabot Posterior Wire Splint, or suitable substitute.

Splints and Splinting. In surgical parlance a splint is a splice to hold broken bones in proper position, until nature unites them. In First-Aid a splint is any device applied *on the spot* where the patient is injured, in order that he may be transported safely, without further shock or local damage to delicate tissues already injured, to a hospital where proper facilities make it possible to carry out the required surgical procedures.

Most of the deaths occuring on the firing line are due to shock and hemorrhage. There, in simple language, we have three things to combat: *Pain, cold,* and *loss of blood.* We have three practical methods at our disposal to meet these conditions; namely, proper splinting, heat, and first-aid dressing. If the wounded soldier is properly splinted and heated up by proper blanketing and hot drinks and his hemorrhage controlled by dressings—*very rarely by the use of a tourniquet*—much of the shock will be reduced and much prevented in the ambulance trip which must of necessity follow.

By proper splinting we add to the comfort of a patient and assist in the healing of his lesion; we allow freedom of motion of other parts of the body, while the injured part remains immobile.

In splinting we have in mind two mechanical principles: *Fixation,* to obtain rest for injured structures, to retain them in proper alignment, and to favor their union; and *Traction,* to obtain muscular relaxation, with the object of diminishing pain and stopping muscular contraction which might result in a faulty position of the injured parts, to secure proper alignment by a pull in the direction of normal anatomical lines, and to prevent the displacement of bony fragments with consequent injury to nearby nerves, muscles, and blood vessels.

In rendering first-aid in gunshot fractures, proper splinting takes first place. Some of the best splinting coming off the firing line in France during the World War was done by *enlisted men* who had been carefully trained in the application of splints.

Splint Set. In our *field medical outfits,* and with all our mobile units, a standard splint set is supplied. All should be familiar with the contents of this set and become proficient in the application of its components. It consists of a canvas case as a protective container, in which are included—6 splint straps, 6 arm splints of the Thomas hinged pattern, 6 leg splints of the Thomas half-ring pattern, 6 wire ladder splints, 6 adjustable straps with buckle, 3 hand and wrist splints, and 5 rolls of wire gauze material. Supplied for use in conjunction with these splints are litter bars, splint rests, and foot supports.

Other splints usually available, in addition to those extemporized, include Cabot's posterior wire splint, and a varied assortment of wooden splints

Application of Splints. This must be learned practically, and preferably should be taught by the *Group Method,* an example of which appears in the following training memorandum, quoted in full, issued by the Headquarters of the First Medical Regiment, at Carlisle Barracks, Pa., on Februrary 18, 1927.

(The *Thomas half-ring thigh and leg splint* (Fig. 104), with which it deals, should be applied in the field to all fractures of the lower extremity, from the pelvis to the ankle. After the splint is adjusted and the soldier is placed on the litter, this splint should always be suspended from a *litter bar.* Otherwise, it tends to be displaced and the traction is lessened.

This splint is made up of two lateral bars of rolled steel, continuous below and connected at the upper end with a padded half-ring. This ring can be turned so that it is interchangeable for the right or left leg. A strap and buckle secures the ring in place.)

* * * * * * * *

THE APPLICATION OF THE THOMAS LEG SPLINT

1. Training in the application of the Thomas splint must be preceded by instruction in the anatomy of the lower limb. This instruction should be given by lectures, combined with demonstrations on human skeleton, and charts. This should be followed by instruction in the various kinds of fractures, and their diagnosis and complications, with special reference to shock. The importance of early splinting, precautions regarding same, and a demonstration of standard types of splints should be taken up in the troop school, and the instruction should then progress to the actual application of the splint.

2. The instruction in the application of the Thomas splint is best given by the Group Method. Fifty or more men may be efficiently instructed at the same time, as described below.

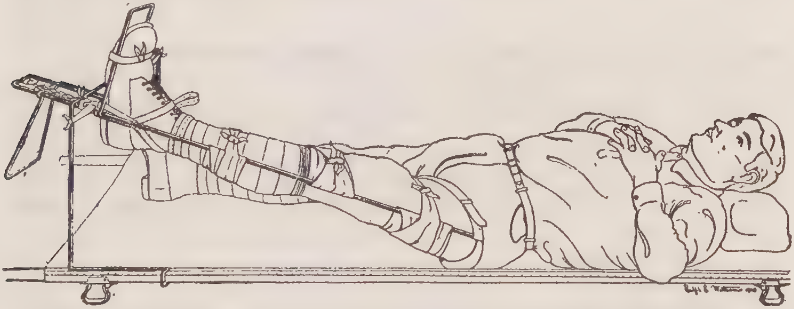


Fig. 104.—Thomas Leg Splint. Traction obtained by adjustable ankle strap, foot support, and splint rest. Leg and thigh supported in splint by folded triangular bandages. Entire splint with attachments secured to litter bar attached to litter. Fracture case ready for transportation.

a. **Equipment.** The equipment required for the Thomas splint application is as follows:

(1) One litter, on supports, for each team of four men.
(2) One Thomas splint, half ring.
(3) Three 12-inch lengths of wire gauze supports (or muslin bandage).
(4) One litter bar.
(5) One foot support.
(6) Three blankets.
(7) One muslin bandage (for Ankle-Hitch).
(8) Three bandages, 3-inch.
(9) Stick, or 6-inch nail, for Spanish windlass.

b. **Personnel.** The personnel required to make up the team of four is:

No. 1—The operator.
No. 2—First assistant.
No. 3—Second assistant.
No. 4—The patient.

c. **Preparation.** Before the arrival of the group to be instructed, the required number of litters should be opened and placed on supports. These are placed in two lines, about eight paces between lines and three paces betwen littrs in line, one litter for the demonstration team being placed on the flank, where all can see each step demonstrated, the arrangement being as follows:

```
     X
  X     X
  X     X
  X     X
  X     X
```

The equipment enumerated in Par. 2, sub-paragraph "a" above, is placed at the foot of each litter.

3. **The Twelve Steps.** a. The group arrives, they count off and are divided into teams as in Par. 2, sub-paragraph "b" above, the front rank taking position on one side, the rear rank on the other. The instructor is then ready to proceed with the following twelve steps in the application of the Thomas splint, which should be memorized by each man in the group:

(1) Dress litter.
(2) Extension.
(3) Dress wound.
(4) Apply splint.
(5) Support leg.
(6) Ankle hitch.
(7) Spanish windlass.
(8) Foot support.
(9) Bandage leg.
(10) Litter bar.
(11) Fix splint.
(12) Cover patient.

The instructor describes briefly each step, then has the demonstration team slowly demonstrate same, he then answers any questions regarding each step, and then has each team in the group proceed in the same manner. After inspecting carefully the application of that step by each team, the instructor is ready to proceed in the same manner with the next step.

b. (1) **Dress Litter.** At the count of "One", the litter is "Dressed" by Nos. 2 and 3. A litter is said to be "dressed" when blankets have been arranged upon it as follows: Place the first blanket lengthwise so that its edge corresponds to one pole of the litter, and fold it back upon itself once. Place the second blanket lengthwise on the first so that its edge corresponds to the opposite pole of the litter, and fold it back upon itself once. The free edges of each of these blankets hang down opposite sides of the litter. The third blanket is not used until the twelfth step, unless considered necessary.

(2) **Extension.** At the count of "Two", the No. 2 man of the team stands at the foot of the litter, facing the patient, and opposite the injured limb. Grasping the heel of the shoe with his right hand and the toe with his left, keeping the arms straight, he exerts a steady pull, thereby producing the necessary extension.

(3) **Dress Wound.** At the count of "Three", while extension is continued by No. 2, the No. 1 and No. 3 men dress any wound present on the limb, the wound being exposed by cutting away the overlying clothing.

(4) **Application of Splint.** At the count of "Four", the splint is slipped on, the short length to the inner side of the leg. The splint should be passed up under the buttock as far as possible, keeping splint level and then fixing the upper strap.

(5) **Support Leg.** At the count of "Five", the 12-inch wire gauze lengths are placed under the leg, forming a trough for the leg to rest in, and located as follows:

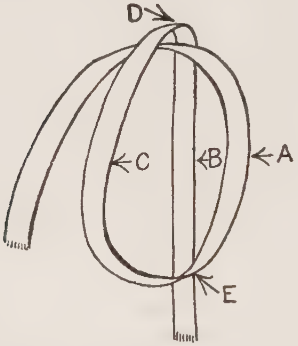
(a) One under middle third of thigh.
(b) One just below the knee.
(c) One just above the ankle.

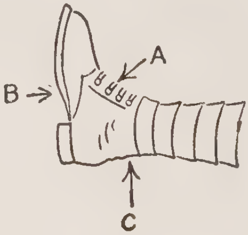
These positions will vary somewhat, depending on the location of the fracture. The edges of the wire gauze are doubled back over the splint rods.

Sharp edges should be trimmed or covered with adhesive plaster.

(6) **Ankle Hitch.** At the count of "Six", the No. 1 man, assisted by No. 3, applies the ankle hitch which is illustrated below (p. 326).

The bandage is held in the left hand, one-third falling to the left of that hand and two-thirds to the right. Pick up the long end with the right hand and form a loop. Drop the long end over the loop as if to tie a single knot but do not bring it through the loop. The hitch is now ready to apply to the ankle. Hold the hitch with the left hand at the point marked "D" and with the right hand at the point marked "B". Place that part of the loop marked "A" over the instep, at the point marked "A" in the diagram below. That part of the loop marked "B" is placed under the arch of the foot at point marked "B", and that part of the loop marked "C" is placed back of the heel at the point marked "C". Draw the hitch into position, both ends of the bandage being held by the No. 2 man, and continuing extension.





(7) **Spanish Windlass.** At the count of "Seven", the two ends of the Ankle Hitch are crossed, one end is passed under and over the splint rod and the other over and under same on the opposite side. The two ends are then fastened to the end of the splint, being tied in the center. The 6-inch nail or stick is now placed between the ends of the bandage, below the point where the ends have been passed above and under the splint rods, and the nail or stick is twisted until the desired amount of extension is maintained. Then fix nail or stick against the splint rods.

(8) **Foot Support.** At the count of "Eight", pick up the foot support and attach it to the splint, the lower hook upward, and inside the rods. Spread the foot support, if necessary, for the purpose of securing the necessary spring to same to hold it in place. Then pull the toe of the shoe up between the rods of the foot support and place a stick or piece of wire gauze between the foot and foot support, and tie a small piece of bandage around same to prevent foot dropping forward.

(9) **Bandage Leg.** At the count of "Nine", the entire leg is bandaged over the splint.

(10) **Litter Bar.** At the count of "Ten", the litter bar is secured to the litter. The lower hook is upward, above the stirrup of the litter, and the two ends should be bent inward to allow the litter bar to clamp on the litter.

(11) **Fix Splint.** At the count of "Eleven", the splint is tied *securely* to the litter bar above so that the splint will hang down about one inch from the horizontal rod of the litter bar. Another tie is made from the

splint rod on both sides and the angle of the foot support and secured to the vertical rod of the litter bar on that side.

(12) **Cover Patient.** At the count of "Twelve", pick up the third blanket, fold once across lengthwise, and place on patient. Then bring the edges of the blanket over same, from side of litter, and pin in place.

4. After the first period of instruction, each member of the group must be required to memorize the twelve steps in the application of the Thomas splint. Each step is carefully checked up as to accuracy of application, after the explanation and demonstration. Continued rehearsals will then gradually develop the desired speed combined with the necessary accuracy.

* * * * * * * *

The Thomas Arm Splint. This splint (Fig. 105) consists of a padded ring connected by hinges with lateral side bars of rolled steel which are continuous below. Indications for its use are: 1. Injuries to the shoulder joint, other than dislocations; 2. fractures of the shaft of the humerus; 3. injuries of the elbow joint; 4. fractures of the forearm.

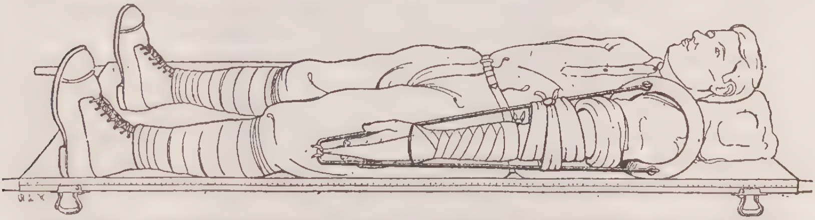


Fig. 105.—Thomas Arm Splint. Traction obtained by adhesive strips to skin, arm and forearm supported in splint by folded triangular bandages. Patient on litter ready for transportation.

The arm and forearm are exposed by removing or cutting away the clothing to the shoulder. Two adhesive traction strips of sufficient length to extend above the fracture are prepared, with the lower ends of each fixed to a piece of bandage or rope. Traction is made on the arm in extension. The adhesive strips are applied to the lateral surfaces of the arm and forearm and are reinforced by circular application of a bandage. The ring of the splint is then threaded over the arm and pushed up against the chest wall. The ends of the traction strips are tied to the lower end of the splint, additional tension being made by twisting the cords with a stick. The arm and splint are brought to the side, and the arm is supported in the splint by slings of muslin bandage or by triangular bandages secured to the two lateral bars. A wristlet must never be used to obtain traction, for regardless of how well it is padded the dangers of circulatory disturbance are too great.

The Cabot Posterior Wire Splint. This splint is a simple skeleton frame made of one piece of rolled steel shafting. It is bent upward at the lower end, at an angle of 90 degrees, to support the foot. The splint may be bent to allow flexion at the knee. The framework is covered with muslin bandages which form a sling or bed between the lateral bars, upon which the leg and foot rest. Additional padding or lateral splinting may be added if necessary. Immobilization is maintained by fixation with bandages only. *Traction is not applied.* The indications for the use of this splint are: 1. Injuries of soft parts of the lower extremity requiring fixation to transport; 2. Injuries to the knee and ankle where traction is not indicated for transport; 3. Fracture of tibia or fibula (when *both* bones are fractured traction is necessary); 4. Fractures and wounds of the ankle; 5. Injuries of the foot.

It is unnecessary to remove clothing unless there is an open wound. The splint is prepared by covering the skeletal metal frame with muslin bandage material, care being taken not to apply it too tightly, lest the flexible side bars be pulled too closely together and cause harmful pressure on soft parts. The bandage acts as a hammock to support the leg and foot. If the clothing is removed, additional padding, such as clothing or cotton, may be used on the splint. If fracture of one of the long bones of the leg is thus being immobilized, *traction* is first applied by the operator. The leg, with the foot resting against the end of the splint, is then fixed in position with a bandage and adhesive plaster.

The Wire Ladder Splint. This splint is made up of sheets of malleable iron wire in the shape of a ladder, as the name indicates, and may be cut into desired lengths. It may be used under certain conditions for fractures of the shoulder, upper extremity, the leg, ankle and foot. It is used sometimes for side splints, in combination with the Cabot posterior wire leg splint.

The Hand and Wrist Splint. This splint (Fig. 106) is a paddle-shaped board with rubber cloth covering, well padded. It is well adapted for use in fractures and severe lacerations of the hand.

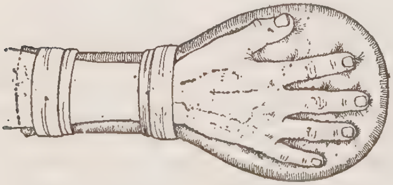


Fig. 106.—Hand and Wrist Splint.

Wooden Splints. These splints are generally made of ¼ inch by 4 inch basswood. Boards from discarded orange or lemon crates make good splints. Indications for their use are: Fractures of the forearm and hand, and to bolster up other splints. The splints are cut into the desired shape and are well padded. In fractures of the bones of the forearm, particularly below the upper 3rd, and fractures of the wrist and hand, anterior and posterior wooden splints are applied while traction is being made. The splints are held with adhesive plaster and bandage. Care must be taken that they are not too tightly applied. The forearm is suspended in a sling.

Extemporized Splints. Frequently the standard splints supplied in the military service are not at hand and splints must be extemporized from pieces of board, fence rails, rifles, carbine boots, cardboard, felt, leather, or any other suitable material.

Application of extemporized splints:

Fracture of the Arm.—Apply two splints, one in front, the other behind, if the lower part of the bone is broken; or to the inner and outer sides if the fracture is in the middle or upper part; support by sling.

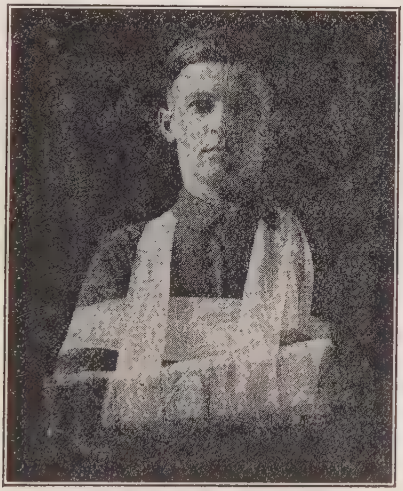


Fig. 107.—Extemporized Splint, Supporting Sling, and Fixation Bandage, for Fractured Forearm.

Fractures of the Forearm.—Place the forearm across the breast, thumb up, and apply a splint to the outer surface extending to the wrist, and to the inner surface, extending to the tips of the fingers; support by sling. (Fig. 107).

Fracture of the Thigh.—Apply a long splint, reaching from the armpit to beyond the foot, on the outside, and a short splint on the inside. (Fig. 108).

The military rifle may be used as an outside splint, but its application needs care. A blanket rolled into two rolls supported by pieces of board forming a trough for the limb is useful. The bayonet and scabbard may be used to advantage in splinting fractures of the thigh and leg. The carbine boot may also be used.

In fractures of the lower extremity the injured member, after being splinted, is firmly bound to the sound leg.

Fracture of the Leg.—Apply two splints, one on the outside, the other on the inside of the limb. When nothing better can be had, support may be given by a roll of clothing and two sticks.

Dislocations and Sprains. A *dislocation* is a permanent slipping away from each other of the bones which form a joint, with locking of the bones in the new position; the joint is out of place. Necessarily the dislocation is attended with tearing of the ligaments and often with rupture of the muscular attachments as well.

The cause is usually indirect violence, especially falls and twists. In attempting to save one's self from falling the hand is thrown out and the weight of the body coming on it causes a dislocation of the shoulder; or the thigh in falling is bent backward, resulting in dislocation of the hip.

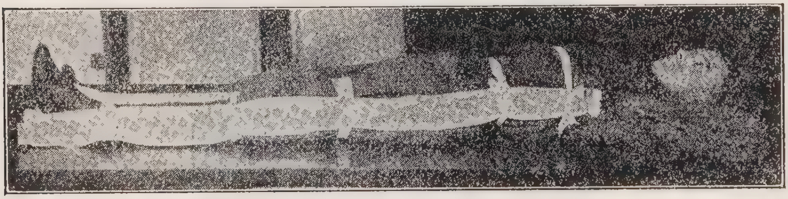


Fig. 108.—Extemporized Splint, for Fracture of Thigh.

Signs. The symptoms of dislocation are as follows: The patient has fallen and cannot move the affected joint; there is pain of a sickening character, often with numbness or tingling in the limb below from pressure on the nerves and blood-vessels; on attempting to move the joint we find that it is locked and cannot be moved; on uncovering and examining it, it will be noticed that there is marked deformity in the joint, and that the limb is fixed in an unnatural position, and appears longer than the corresponding limb on the other side.

A dislocation must always be carefully distinguished from a fracture or a sprain. In fracture there is unnatural movement between the joints instead of immobility at the joint, and the movement is attended with a grating sensation and sound; the deformity is between the joints and there is usually shortening of the limb.

In sprains there is absence of any of the signs of dislocation except swelling and pain; the joint can be moved, though the patient will resist on account of pain. Always uncover the limbs and compare the corresponding joints on the two sides.

If the services of a surgeon can soon be obtained nothing should be done for dislocations except to loosen the clothing about the injured part and support it as comfortably as possible in the new position. If the patient must be moved the limb should be supported in a sling, or by splints and bandages.

When, however, a medical officer can not be reached for some time, there are certain dislocations which a medical soldier may attempt to reduce. He must always remember that no force is to be employed, as it may do serious damage to the important vessels and nerves near the joint; the secret of success lies in the skillful manipulation with a clear understanding of the anatomy of the joint.

Shoulder. *Dislocation of the shoulder* occurs more frequently than dislocation of all the other joints in the body taken together; the reason of this is anatomical; the most common dislocation of the shoulder is downward (Fig. 109). The symptoms are those described for dislocations in general; there will be a hollow under the point of the shoulder which will be very conspicuous when compared with the convexity on the other side, and the head of the bone can be felt in the arm pit where it should not be. To reduce this dislocation place the patient on his back on the ground; sit beside him; remove one shoe from your foot and place that foot in the patient's axilla; then using the foot as a fulcrum, draw the arm downward in the direction of its axis, then outward, and finally carry it across the chest; or *Kocher's method* may be tried as follows: Flex the forearm to a right angle, bring the elbow to the side; carry the hand and forearm outward; then lift up the elbow and sweep the forearm across the front of the chest. If successful the humerous will suddenly slip into place with a click; the arm should then be bandaged to the side for a week or two to give the torn ligaments a chance to heal. If unsuccessful after a few minutes' trial further attempt should be abandoned and expert surgical aid summoned. A shoulder once dislocated is usually permanently weak, and the dislocation is apt to recur from slighter violence than at first.

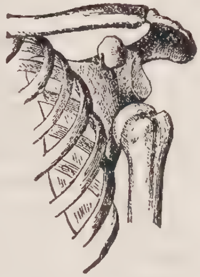


Fig. 109.—Subglenoid Dislocation of the Shoulder

Jaw. In *dislocation of the lower jaw* (Fig. 110) the patient can not speak or close the jaws, and is in great distress.

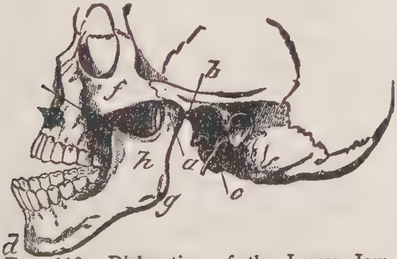


Fig. 110.—Dislocation of the Lower Jaw.

This dislocation sometimes occurs as the result of undue yawning and is usually reduced without much difficulty, but there is great danger of the thumbs of the operator being bitten. Wrap the thumbs well with a handkerchief or bandage; stand in front of the patient, and while pressing with the thumbs in the mouth, just back of the last lower molars, at the same time with the fingers lift up the chin; the jaw will usually at once snap into place, and the thumbs must be quickly withdrawn to prevent them being bitten. After reduction bind the lower jaw to the upper with a four-tail bandage. (See Fig. 102).

Finger. In *dislocation of the finger joints* pull on the dislocated end, at the same time bending it backward if the dislocation is forward, or forward if the dislocation is backward, and pushing the joint into place. After reduction strap or splint the finger.

Knee. The *patella* or *knee-cap* may be dislocated outward or inward; there is sickening pain, the knee cannot be moved, and on examination there is a hollow in front of the knee where there should be fullness, and the patella can be seen and felt in its new position.

Extend the knee as much as possible, and flex the thigh, so as to relax the muscles, when the patella can usually be pushed into place.

Sprains. In *sprains* the joint surfaces slip apart, tearing the ligaments, but slip back into place again; a sprain is really a momentary dislocation. The tearing of the ligaments causes hemorrhage into and around the joint, and as the blood can not escape externally the joint is immediately swollen; that the swelling is due to the bleeding is shown by the black and blue discoloration of the skin over the joint, which begins to appear after a day or two, as the blood comes to the surface.

The treatment consists in stopping the hemorrhage, causing the absorption of the blood already poured out, and supporting the joint until the ligaments heal.

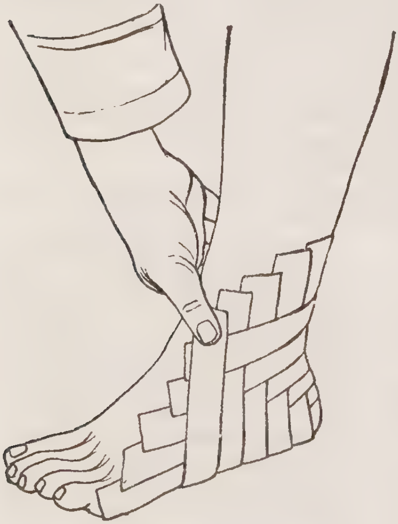


Fig. 111.—Strapping the Ankle.

A *sprained ankle,* the most common of all sprains, may be taken as a type. The patient twists his foot stepping on a stone, there is sharp pain in the ankle, lameness, and prompt swelling of the joint, but the joint is movable, thus excluding dislocation, and there is an absence of the signs of fracture.

To control the bleeding taking place inside, put the foot at once into a pail of hot water, as hot as can be borne, and keep it there ten minutes; or if there is no water hot enough use ice water. Next shave, dry and powder the foot, and then strap the joint firmly with adhesive plaster, using strips about an inch wide and fifteen to eighteen inches long (Fig. 111). The first strap should form a stirrup for the heel, closely following the tendo Achillis on each side; the second should cross the first at a right angle, extending along the border of the foot from the root of the little toe to the root of the great toe or *vice versa;* the third strap covers one-third of the first, and the fourth one-third of the second, and so on until the entire ankle is covered, except a narrow strip in front, which is left open to allow of free circulation. Each strap is drawn tight and the crossings are made strongest over the swelling. When the strapping is completed a bandage is applied over all until the plaster is firmly adherent, when the bandage is removed, the sock and shoe put on, and the latter firmly laced, after which the patient should begin to walk, commencing with a crutch or cane.

The walking is at first very painful, but must be persisted in, as the plaster takes the place of the torn ligaments and the movement of the joint in walking causes rapid absorption of the blood. As the strapping becomes loose it must reapplied, after through massage of the joint.

Foreign Bodies. *In the Eye:* Foreign bodies, such as particles of dust, cinders, etc., may lodge under the lids, upon the conjunctiva, or upon the cornea. In the latter situation they are seen and removed with the greatest difficulty, and the removal should not ordinarily be attempted by other than a physician. To remove a foreign body from the eye the best improvised appliance, and one that is nearly always at hand, is a match. Light the match and after it has burned a moment blow it out; then with a clean handkerchief and a circular movement of the fingers wipe off the charred end, leaving a soft, aseptic, splinterless point with which to remove the foreign body.

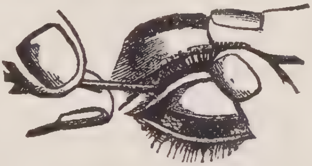


Fig. 112.—Eversion of the Upper Eyelid.

To examine the lower lid draw it down with the fingers, at the same time telling the patient to look up; if the foreign body is not found there, evert the upper lid (Fig. 112) by standing behind the patient with his head upon your chest and telling him to look down at his feet; at the same time press a match or the end of the finger firmly against the outside of the lid about a quarter of an inch behind its margin, draw the lid down by the lashes and turn it upward and outward over the match or finger tip. If the particle is still not visible search the ball of the eye carefully for it, and when it is found lift it off gently by a quick movement with the point of the match. If the eye is very irritable it may be necessary to drop in a little cocaine solution.

It is important to remember that even after a foreign body is removed from the eye, there is often for some time a sensation as if it were still there.

In the Ear: The foreign body here may be an insect, a pea, or grain of wheat, a pebble, a plug of hardened wax, etc. An insect in the ear, by its movements and buzzing, often causes the most intense annoyance.

Hold the head over on one side, with the ear containing the insect uppermost; fill the ear with warm water; this will drown the insect in a few minutes, and then by suddenly turning the head to the other side it may come out with the water; the maneuver should be repeated several times; if the insect does not come away, gently syringe the ear.

If the foreign body is vegetable, such as a pea, water should not be used as it may cause the pea to swell and thereby render its extraction more difficult. If the pea is visible use a suitable instrument, or if one is not available, bend the loop end of a fine hairpin, and try to get beyond it so as to hook it out. As there is always danger of injuring the drum when instruments are passed into the ear, it should be a guiding rule that no instrument should be passed beyond the point where its tip can be seen.

Hardened wax must be removed by syringing with a warm five per cent solution of soda.

In the Nose: Children push peas and such things into the nose, and occasionally flies deposit their eggs there with the result that maggots develop in the nasal cavity. Foreign bodies are best removed by closing the free nostril with the finger and forcibly blowing through the obstructed side; snuffing up a little powdered tobacco or pepper will cause sneezing and aid in the expulsion; if this does not succeed and the body can be seen it may be hooked out with the bent hairpin in the same manner as described for the ear; or finally a small, smooth stick or a slender pencil may be wrapped with a little cotton and used to push the foreign body gently back through the posterior nares into the mouth; press straight backward, never upward.

In the Throat. Foreign bodies *in the throat* are usually bones or masses of food. If the bone can be seen and reached, it may be removed by fingers or forceps; if not, it may be carried down by eating dry bread. If the obstruction is a mass of food it may be dislodged by forcible blows on the back between the shoulders, or the fingers may be passed into the throat to hook it out or to cause its ejection by vomiting.

Foreign bodies in the air passages cause violent coughing and difficult breathing; the case is urgent, and if a child he may be held up by his heels and shaken; if an adult inversion may also be attempted and blows between the shoulders given as in case of foreign body in the throat.

Foreign bodies are sometimes swallowed and reach the *stomach* and *intestines.* Such cases are not usually serious. If the foreign body is angular or pointed, such as a tack or a pin, feed the patient on substances which leave considerable residue to cover and protect the sharp points—potatoes, spinach, bananas, bread, etc. Do *not* give laxatives, as they will render the movements liquid and thus leave sharp points exposed.

In the Skin: Here we find *splinters, thorns, needles, pins, fish-hooks, pieces of glass, gunpowder, etc.* For splinters and thorns pass the point of the blade of a pocket-knife under them, with the thumbnail press the splinter against the blade and draw it out; or use a pointed dissecting or dressing forceps. If the splinter is buried, open up the skin a little with the point of a knife or a needle until it can be reached. If under a nail, make a notch in the nail so as to expose it.

If a needle or pin is broken off in the skin and can not be grasped with forceps, cut a small hole in the end of a cork and press it down over the point of entrance of the needle; this may cause the needle to emerge so far that it can be grasped. The needle may be so situated that it is best to push it through and extract it on the other side. If the needle or pin is in the foot or hand and can not be extracted, the patient should be directed not to use the part, as muscular action will cause it to work in deeper. A fishhook or an arrow can not be drawn out on account of the barbs; they must be pushed through. Gunpowder is best removed by a thorough scrubbing with soft soap and a stiff brush, the remaining grains being picked out with a needle. As after treatment use iodine or similar antiseptic and always bear in mind the possibility of tetanus ensuing. If tetanus is feared antitetanic serum must be given.

Effects of Heat and Effects of Cold. The *effects* of *heat* may be general or local. The *general effects of heat* are manifested in two entirely different ways, viz.: heat stroke and heat exhaustion.

Sunstroke. *Heat stroke, sunstroke,* or *insolation* is due to prolonged exposure to excessive heat; usually the heat of the sun. But heat stroke may occur in hot rooms, and in the stoking-rooms of steamships. Exhaustion and improper clothing are powerful contributing factors, hence it is especially apt to occur to soldiers on the march.

The premonitory symptoms are headache, dizziness, irritability, frequent desire to urinate, seeing things red or purplish; with or without these symptoms the patient suddenly falls unconscious; the skin is dry and intensely hot; pupils contracted; pulse full and strong; respirations snoring; there may be convulsions; if the temperature of the body can be taken it will usually be found to be very high, 105° F. to 109° F. or higher.

The condition is a very serious one and unless immediately relieved terminates in death.

The treatment has for its object rapid reduction of the temperature. The man should be brought to the coolest accessible spot, in the shade if out of doors, on deck if in the fire room of a steamer, his clothing removed and an ice bag applied to his head and cold water poured over him continually. At the same time the body may be rubbed with ice, and if a tub is available he may be immersed in cold water. The treatment should continue until the temperature is reduced. If the patient is able to swallow he should be given cold, not iced, water to drink, and this should be repeated as often as possible.

Serious results are liable to follow a sunstroke, even when death does not occur; the most common of these after-effects are permanent headache, paralysis, mental confusion, or even insanity. Moreover, one who has had a sunstroke is ever after very susceptible to the action of the sun.

Heat Exhaustion. *Heat exhaustion* is a very much less severe condition, closely allied to fainting. It occurs among soldiers on the march and very frequently among soldiers standing for some time at *attention* on a hot day. The soldier suddenly drops his piece and falls; he is not unconscious and may be easily aroused; face is pale, skin cool and moist, pupils dilated or normal, pulse very weak; respiration shallow, perhaps sighing.

Such a patient should be moved into the shade, his clothing loosened, equipments removed, head kept low, and a drink, of water or some stimulant, given. On removal to the hospital he should be kept perfectly quiet in bed and hot-water bags used if necessary.

Burns and Scalds. The *local application of heat* produces burns or scalds.

Burns are produced by a flame, hot solids, or caustics. *Scalds* are produced by hot liquids; they differ only in that in the former the hairs are destroyed, in the latter they are not; the treatment is the same.

Burns are usually said to be of the first, second, or third degree. Burns which merely cause redness are of the *first degree;* if blisters are raised they are of the *second degree;* and if there are charring and destruction of tissue the burn is of the *third degree.*

The symptoms of burn are shock, which may be profound, chilly sensations, and pain. The pain may be agonizing or slight.

The result of the burn depends more upon the extent of surface affected than upon its depth, a burn of the first degree is almost certainly fatal if two-thirds of the surface of the body is affected, and one of the second degree if one-third of the body is burned; the chances for recovery are much less in children and elderly people.

The danger in the first twenty-four hours is from shock; after that from internal congestion and inflammations, suppression of urine, ulceration of the duodenum, and intestinal hemorrhage; and finally from exhaustion, blood poisoning, or tetanus.

If the entire thickness of the skin is destroyed terrible deformities are apt to follow the contraction of the skin which occurs in healing.

In burns of the first degree, of which *sunburn* is a type, soft cloths dipped in a saturated solution of cooking soda should be applied, and this followed by any fresh oil or fat; cream or olive oil answers exceedingly well.

In burns of the second and third degrees the objects of treatment are first protection from the air, which greatly aggravates the pain and shock; secondly, relief of shock, and third, prevention of infection.

The quickest temporary means of excluding air is to immerse the part or the entire body in warm water; then having gotten everything ready carefully cut away the clothing, leaving such as is sticking to the burned skin; blisters should be left undisturbed unless they are very tense and painful, when they may be punctured by a sterilized needle and the contents allowed to escape.

The wound should next be dressed with sterile gauze dipped in a warm solution of boric acid, or a solution of picric acid, ten parts, in eighty parts of alcohol, and a thousand parts of water; the picric acid relieves the pain and has value as an antiseptic; over the gauze place a thick layer of sterile absorbent cotton. When the burns are extensive small portions only should be exposed and dressed at a time. When the first dressing is finished it should be left on as long as possible.

Meantime stimulants and hot drinks should be given internally, and morphine and strychnine injected hypodermically, if necessary.

When there has been skin destruction the parts should be retained in proper position by splints when healing is taking place.

In *burns from corrosive acids,* such as sulphuric and nitric acids, the parts should be thoroughly flushed with water and a solution of soda, after which the treatment is the same as for other burns.

In *burns from caustic alkalies,* such as lye, vinegar diluted with water should be used to neutralize the alkali, before applying the usual treatment for ordinary burns.

When the clothing of a person, usually a woman, is on fire she should be enveloped in a blanket, rug, cape, or woolen coat and thrown upon the ground while the flames are being smothered; the reason she should be thrown upon the ground is to prevent her from running about and thus fanning the flames, and also because flames rise, and in the erect position would reach the mouth and throat.

Freezing. The *effects of cold,* like those of heat, may be general or local.

In *general freezing* there is at first a very unpleasant sensation of cold with pain in the extremities, then numbness and stiffness, and finally great drowsiness with an irresistible desire to lie down and sleep, which if yielded to is soon followed by death.

When one is found in such a condition, life not yet being extinct, he should be taken into a cold room, all clothing removed, and the body rubbed briskly with sheets or towels wet with cold water. As soon as the stiffness is removed artificial respiration should be performed; and when the patient is able to swallow, warm drinks should be given. When there are signs of returning consciousness and circulation, the body may be enveloped in a blanket and the temperature of the room gradually raised.

The reason a frozen person must not be brought into a warm room is that the sudden restoration of the circulation gives rise to violent congestions and often to sudden death from the formation of clots in the blood-vessels.

Frost-Bite and Chilblain. *Local freezing* is of two degrees, frost-bite and chilblain.

Frost-bite is usually of the extremities, fingers, toes, nose, or ears, but a whole limb may be frozen. The part is at first red and painful, then livid, and finally white, hard, and painless; the sudden cessation of pain in the freezing part is always a bad sign. The danger of frost-bite is that sudden thawing may cause such severe congestion as to result in gangrene.

Therefore the patient should not go into a warm room or near a fire. Rub the part vigorously with wet snow or ice water, never with dry snow as the temperature of dry snow may be much below freezing, and rubbing with it would aggravate the condition. When the pain and redness return apply cold dressings.

Chilblain is a condition of acute or chronic congestion occurring especially in the feet, and due to bringing cold feet near the fire too suddenly, or merely following exposure to cold in persons with poor circulation. On the part affected are red spots, more or less swollen, which burn and itch intensely. The treatment consists in stimulating applications, such as liniments and tincture of iodine. Susceptible persons should wear woolen socks.

Shock, Insensibility, and Fits. Among *conditions causing insensibility* are shock, fainting, concussion and compression of the brain, apoplexy, lightning strokes, electric shock, heat stroke, freezing, epilepsy, Bright's disease, alcoholism, narcotic poisoning, and asphyxia or suffocation.

Shock. This is a condition of collapse produced by any severe injury or emotional disturbance. It is usual after severe operations, as the result of pain, or of extensive injuries, and especially follows gunshot wounds.

Shock may be described as primary or secondary, according to whether it comes on at the same time as the cause or at a later period.

Primary shock. The symptoms come on at once and vary with the injury inflicted, from a slight momentary faintness or giddiness, closely resembling a fainting attack, to immediate and complete prostration, insensibility and even death. The pulse, at first small and weak, soon becomes irregular, extremely rapid and almost imperceptible; the countenance is pallid and shrunken and the brow covered with cold sweat; the respirations are slow and shallow, while the temperature is subnormal. After an interval, under appropriate treatment, reaction sets in, which shows itself by increased strength and frequency of respirations and a stronger and slower pulse; the surface of the skin becomes warmer while consciousness and muscular power are gradually restored. During this period vomiting may occur.

Secondary shock. This is the condition into which an individual passes unless the primary shock has received appropriate treatment, and is a far more serious condition. Thus it occurs in the later stages of operations, after very severe injuries, and is aggravated by loss of blood, exposure to cold, absence of food, fear, etc. The symptoms of secondary shock are those of the later stages of primary shock. The patient lies in bed in a state of collapse. The surface of the body is cold and covered with a cold, clammy sweat; the pulse is weak and very often so rapid that it cannot be counted; the finger-tips, ears, etc., become blue; the respirations rapid and shallow; the patient is unconscious, and unless rapidly treated dies quickly.

Treatment. In slight cases nothing is required beyond resting for a few minutes, keeping the head well down, and the use of aromatic spirit of ammonia or a smelling salt. The patient in more severe cases is wrapped up and kept warm with hot blankets or electric lamps placed under the bed clothes, care, however, being taken to protect the patient from being burnt, and hot drinks given. In the severest cases the patient is laid flat with the head low, and steps should be taken to maintain the bodily heat with blankets and hot-water bottles. In the field litters are "dressed" and lights placed beneath to cause hot air to envelop the patient. Steps are taken to arrest hemorrhage. Pain must be relieved by morphine if necessary, and hot saline solution given by the rectum; when the patient can swallow, hot coffee may be given.

Fainting. This condition is due to too little blood in the brain, and is caused by mental impressions, exhaustion, heat, bleeding, over-crowded rooms, etc. The symptoms are sudden unconsciousness, pale face, cool, moist skin, weak pulse, shallow breathing, and dilated pupils.

Treatment. Get more blood to the brain by laying the patient flat on his back with the head low and the legs raised; sprinkle cold water in his face and apply ammonia or smelling salts to the nostrils to make him breathe; get him out of a crowd into the fresh air; loosen the clothing about his neck and waist.

If he is sitting in a chair and about to faint the attack can often be prevented by thrusting the head down between his own knees and holding it there until the face becomes flushed.

Concussion. *Concussion of the brain* is the condition present when we say a man has been "knocked senseless" or "stunned." It is a jarring and shaking of the brain due to blows or falls upon the head or falls upon the feet; the brain almost stops working for a while. The symptoms are unconsciousness, pallor of the face, breathing so quiet and shallow that it can hardly be detected, pulse fluttering, pupils equal and usually contracted.

The degree of insensibility varies; sometimes the patient can be aroused, but is irritable and lapses again into unconsciousness, which may last minutes or hours. Vomiting and turning on the side are favorable symptoms.

Treatment. Perfect rest in a dark, quiet room; warmth externally if the surface is cold; aromatic spirits of ammonia internally, or by inhalation if there is much depression.

Compression. *Compression of the brain* is, as its name implies, a pressure on the brain. This pressure is usually due either to a piece of bone, or to blood from a torn vessel which has escaped inside the cranium and, as it can not get out, must compress the brain, and this compression prevents certain parts of the brain from working. When the bleeding is the result of injury the condition is called simply compression of the brain; when it is the result of the bursting of a diseased vessel without any violence it is called *apoplexy;* the result and the symptoms are just the same.

The symptoms of compression are profound unconsciousness; loud, snoring breathing; slow pulse; pupils usually unequal and not reacting to light, and paralysis on one side of the body.

If the compression is due to a piece of broken bone the symptoms come on immediately after the injury, while if it is due to bleeding they may come on later and gradually.

Treatment. If the compression is due to a piece of depressed bone the bone must be raised. If due to bleeding, the bleeding must be stopped;

surgical relief can only be given by a surgeon, but meantime keep the patient quiet with his head slightly raised; apply an ice bag to the head, give him a hot mustard foot bath, and put on his tongue, a few drops of croton oil in a teaspoonful of sweet oil, so as to send the blood from his brain to the feet and intestinal tract.

Shock from Electricity. *Lightning stroke* may cause sudden death, insensibility, or severe burns. If the patient is unconscious but living, effort should be made to keep him alive; perform artificial respiration if the breathing fails; give stimulants if the heart is weak, and apply heat externally if the surface is cold. Burns must be treated like other burns.

Electric shock is caused by coming in contact with a "live wire"; spasmodic contraction of the muscles occurs so that the person can not let go. The condition and results are exactly like lightning stroke.

The first thing to be done is to rescue the patient by setting him free from the wire, and this must be done with great care, as to touch him with the bare hands will cause the rescuer to get the same shock.

Immediately break the circuit. With a single quick motion, free the victim from the current. Use any *dry* nonconductor (clothing, rope, board) to move either the victim or the wire. Beware of using metai or any moist material. While freeing the victim from the live conductor have every effort also made to shut off the current quickly.

The treatment of the shock is the same as in the case of lightning shock.

Alcoholism. The forms of unconsciousness due to heat stroke and to freezing have already been described.

Unconsciousness from actute alcoholism is the condition known as *"dead drunk."* The patient is insensible, though he can usually be partially aroused, the face is flushed and bloated, eyes bloodshot, pupils usually dilated, skin cold and clammy, temperature subnormal, respiration snoring, pulse rapid and weak; there is no paralysis.

Treatment. The case is one of acute poisoning by alcohol. The first thing to be done is to empty the stomach, by tickling the throat or by giving an emetic of mustard or salt and warm water. Then sprinkle cold water freely upon the face, but apply heat to the body; a cup of hot coffee may help to clear the brain after the stomach is emptied. Usually an undisturbed sleep is necessary.

It must not be forgotten that alcoholism and apoplexy are frequently confounded, the more so as a man who has been drinking and has the odor of liquor upon his breath may be stricken with apoplexy.

In apoplexy there are paralysis, unequal or contracted pupils, some fever, slow pulse; in alcoholism no paralysis, equally dilated pupils, rapid pulse, subnormal temperature.

Epilepsy. In *epilepsy* there may be *fits* with insensibility, or a mere momentary unconsciousness with slight muscular twitching, but in which the patient does not fall.

In the severe form, with or without some premonitory sign, the subject suddenly cries out in a peculiar manner and falls in a fit; at first the entire body is rigid, then there are general convulsions with jerking of the limbs, contortions of the face, and foaming at the mouth; after a few minutes the convulsions are followed by profound stupor, and this generally passes off in deep sleep. During the attack the eyeballs may be touched without the patient flinching, the pupils are dilated, he often bites his tongue, and there may be involuntary evacuations of the bowels and bladder.

Epileptic stupor may be distinguished from other forms of unconsciousness by the history of the fit, and of other fits, by the foam at the mouth and the bitten tongue, and by the absence of any paralysis.

Treatment. You can do nothing to stop the fit or to control it; all that can be accomplished is to prevent the patient from hurting himself and to make him as comfortable as possible; do not attempt to hold him, but twist a handkerchief and passing it between the jaws tie it at the back of the neck to keep him from biting his tongue until after the fit is over; after which let him sleep as long as he wishes.

Epileptic fits are sometimes feigned by soldiers in order to secure their discharge. The feigned attacks usually occur at night when no one can see them; the man does not fall so as to hurt himself, does not bite his tongue, flinches when the eyeball is touched; the pupils are not dilated; the patient can be aroused; when there is foaming at the mouth a piece of soap will often be found inside.

A pail of cold water suddenly thrown upon the man's head and shoulders usually makes the diagnosis; it promptly revives the malingerer, but has little or no effect upon the epileptic.

Bright's Disease. *The insensibility of Bright's disease* is really an acute poisoning from the retention of the waste products which the diseased kidneys are not able to carry off. The unconsiousness is often attended with delirium and convulsions. The pupils are contracted, the pulse slow, and the breathing loud and snoring.

The distinguishing characteristics are the history of Bright's disease, the waxy color of the skin, sometimes dropsy, the equally contracted pupils, the absence of paralysis.

Emergency treatment: Cold cloths to the head and a hot mustard poultice to the back over the kidneys.

Opium Poisoning. In *opium poisoning* the patient may be very sleepy or deeply unconscious, the pupils are minutely contracted, the respiration very slow, as low as eight or ten to the minute, and snoring, and the pulse rapid and weak. If the opium has been swallowed, empty the stomach by an emetic, and then give a half gramme of permanganate of potash dissolved in half a pint of water, to destroy what opium is left.

Next keep the patient awake by giving him strong, black coffee, pinching him, talking to him, and walking him up and down if possible, but not to the point of exhaustion.

Asphyxia. *Asphyxia* or *suffocation* is that form of unconsciousness due to the cutting off of the supply of oxygen to the lungs. This may occur in several ways. The air may be so full of some other gas that the proper amount of oxygen cannot reach the lungs; this is what happens in cases of poisoning from illuminating gas, the gasses in mines, etc.

When a person is buried up to his neck in a slide of earth or snow he may be asphyxiated as a result of the inability to expand his chest, even though the mouth and nose be free. The air may be cut off at the mouth as when one is smothered by a pillow; in the throat by the lodgment of food in the larynx, or its obstruction with the membrane of diphtheria. The supply of air may be shut off by the pressure of a rope or fingers when one is hanged or strangled. In drowning, water gets into the air passages and mechanically shuts off the air. Finally, when anesthetics, such as ether or chloroform, are given, asphyxia may result from an insufficient admixture of air.

Treatment. The treatment of asphyxia consists first in removing the cause, second in restoring the breathing by artificial respiration. If the patient is overcome by gas remove him to the fresh air, if he is taking an anesthetic stop it, if he is buried in a snow-slide dig him out as quickly as possible, if there is a piece of meat in the throat put your finger in and hook it out or beat him between the shoulders and jar it out. If the larynx is obstructed by membrane it may be necssary to make an opening into the trachea (tracheotomy) and put in a tube; if the patient is hanging cut him down; if he has been drowned get the water out of his air passages; do these things first, then perform the artificial respiration.

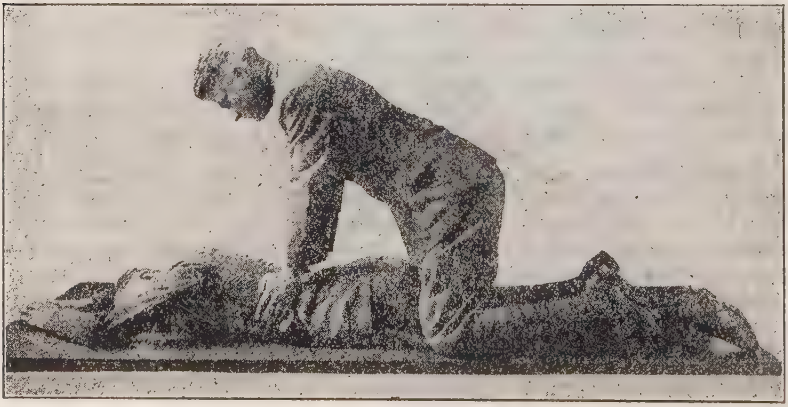


Fig. 113.—Position to Revive Patient by Artificial Respiration.

Artificial respiration seeks to imitate the natural breathing. The following method of artificial respiration, which can be carried out by one person without great exhaustion for one or two hours, is considered the best.

Schaefer Method of Artificial Respiration. The man is laid on his stomach, face turned to one side so that the mouth and nose do not touch the ground, his arms extended from his body beyond his head (Fig. 113). In this position the tongue does not obstruct the air passages, but falls forward of its own weight, and the removal of any foreign body, tobacco, chewing gum, or false teeth, or of mucus, blood, or vomitus is facilitated.

The operator kneels, straddling one or both of the patient's thighs, facing the patient's head, and places his hands, with the thumb nearly parallel to the fingers, so that the little finger curls over the end of the lowest rib. The lower margin of the hand must be free from the pelvis and resting on the lowest rib. The ribs can be more easily located and the pelvis avoided by operating on the bare back of the patient.

The nearer to the ends of the ribs the heels of the hands (thenar and hypothenar eminences) can be placed, without sliding off, the better the position. Thus the hands are far removed from the spine and the fingers nearly out of sight. The fingers help some, but the chief pressure is exerted by the heels of the hands, the weight coming straight from the shoulder. To bend the arms and shove the hands in at the sides, in addition to the vertical pressure, is a waste of energy, being less beneficial than the vertical pressure alone. The operator's arms should be held straight and pressure exerted from his shoulders by bringing his body and shoulders forward. This weight is gradually increased until, at the end of *three seconds* of vertical pressure on the lower ribs of the patient, the force is felt to be sufficient to compress the parts; then the weight is suddenly removed; if there is danger of not returning the hands to the right position they may remain lightly in place, but it is usually better to remove the hands entirely.

With an overweight patient, a light operator can utilize over 80 per cent of his weight by raising his knees from the ground and supporting his weight entirely on his toes and the heels of his hands; the latter properly placed on the ends of the floating ribs of the patient. In this manner he can work as effectively as a heavy man.

A feather, or a few fibers of absorbent cotton, held near the patient's nose will indicate whether or not air passes with each forced expiration and spontaneous inspiration. The rate of compression should not exceed 12 or 15 times per minute, the lungs being thoroughly emptied by 3 seconds of pressure and allowed 2 seconds to refill.

There are liable to be evidences of life within 25 minutes in patients who will recover from electric shock, but where there is doubt the patient should have the benefit of it. In drowning, recoveries after 2 hours or more of unconsciousness, are on record.

Aromatic spirits of ammonia on a handkerchief may be placed continously within 3 inches of the nose; no liquid will be given a patient while unconscious; apply warm blankets and hot-water bottles as soon as practicable.

Due caution should be observed not to bring force to bear too violently on the ribs, lest fracture occur.

Drowning. Being under water for four or five minutes is generally fatal; but an effort to revive the apparently drowned should always be made, unless it is known that the body has been under water for a long time. It is of the first importance in attempting to revive cases of this character that artifical respiration be begun at the earliest practicable moment, as soon as the patient is on shore or in a boat; and it must be continued, in many instances, an hour and a half or two hours before the case is considered hopeless. After the patient begins to breathe, watch carefully to see that he does not stop again, and when he breathes faintly, assist him with artificial respiration. Do not attempt to raise the patient nor allow him to rise until breathing has become regular. As soon as the patient is removed from the water, lay him face down and, grasping him around his waist, raise his hips so that any water may drain out of the air passages while the head remains low. (Fig. 114).

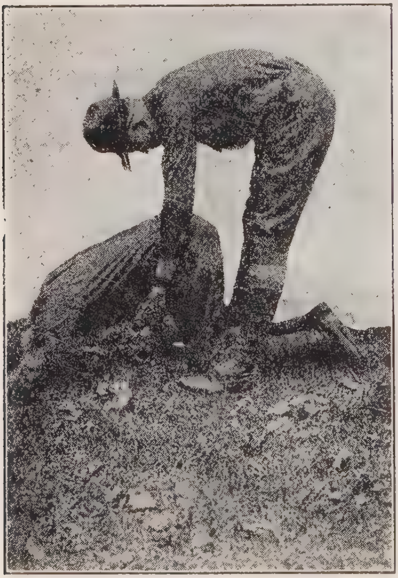


Fig. 114.—Getting Water Out of the Lungs

Then proceed with the Schaefer method of artificial respiration.

Besides artificial respiration it is necessary to restore the heat of the body, which is rapidly lost by immersion in the water, and to stimulate the circulation.

While efforts at artificial respiration are going on remove the wet clothing, wrap the body in dry, hot blankets, apply hot-water bottles to the feet, and rub the limbs actively toward the heart; stimulants should be given hypodermically, by the rectum, and by the mouth when the patient can swallow.

Poisoning. Poisons may be divided into two classes. *those which are taken internally* or *hypodermically,* and *those which are applied to the skin.*

Of those taken internally the *caustic acids* and *alkalies* may also be applied to the skin; in either case they produce burns. When swallowed the burns are upon the lips, in the mouth, throat, and stomach. The stains are seen upon the lips, and the symptoms are intense pain and agony, and vomiting of bloody matter mixed with mucus and shreds of membrane. The *treatment* consists in trying to neutralize the poison, protecting the burnt surfaces by administering soothing substances such as oils, milk, white of eggs, flour and water, etc., and relief of pain by opiates.

The *caustic alkalies,* such as lye, are best neutralized by vinegar or lemon juice and water, and the *caustic acids,* such as sulphuric and nitric, by magnesia, cooking or washing soda, tooth powder, or soap suds. The remainder of the internal poisons may be divided in three general classes:

1. *Those whose principal effect is upon the gastro-intestinal canal, causing violent irritation* or *inflammation,* such as arsenic, corrosive sublimate, nitrate of silver, oxalic acid, croton oil, and sugar of lead.

2. *Those which produce little or no local irritation, but have a powerful general effect, especially upon the nervous system;* such as opium, chloral, belladonna, prussic acid, and strychnine.

3. *Those which are both local and general poisons;* such as phenol, cantharides, phosphorus, and aconite.

In the *treatment* of cases of poisoning our first object is to empty the stomach and prevent the absorption of any poison that may be left in it; then to relieve pain and obviate the tendency to death.

An emetic is ordinarily used to empty the stomach, and those which are most readily available are warm water, mustard, salt, and ipecac; give a tablespoonful of mustard or salt or a half-teaspoonful of ipecac dissolved in a half-pint of tepid water; encourage vomiting by running the fingers down the throat or tickling it with a feather; the water should be tepid to produce nausea, and vomiting should be repeated until the water returns clear. If a stomach tube is available the stomach should be washed out.

To prevent absorption we give an antidote, that is, something that will destroy the poison or its effects, usually rendering it insoluble.

Antidotes. Antidotes are general and special. The *general antidotes* are given when we do not know the exact nature of the poison; thus tannic acid and substances such as tea which contain it are antidotal to the poisonous alkaloids and therefore to most vegetable poisons, and albumin and substances such as white of egg, milk, etc., which contain it are antidotal to most mineral poisons. The *special antidotes* should be used when we know the exact nature of the poison; hydrated magnesia or hydrated oxide of iron is the special antidote to arsenic, salt to the nitrate of silver, chalk or tooth powder to oxalic acid, soluble sulphates such as Epsom or Glauber's salts to phenol and sugar of lead, sulphate of copper to phosphorus, and permanganate of potash to opium.

The antidote is given at the same time as or immediately after the emetic.

The relief of suffering calls for soothing, bland liquids, such as olive oil or milk when there is burning pain in the stomach and bowels, and also for morphine hypodermically.

To obviate the tendency to death observe in what way life is threatened and endeavor to counteract that effect. If there is shock and collapse, use stimulants, warmth, and rubbing; if the heart is failing as in poisoning by aconite, chloral, or prussic acid stimulate it by hot coffee, strychnine, digitalis, etc.; if there is failure of respiration as in phenol poisoning use coffee, cold douching, and artificial respiration; if there are violent convulsions as in strychnine poisoning use bromides, chloral, or chloroform; if there is tendency to sleep keep the patient awake by the administration of coffee, slapping the face and chest with a wet towel, and walking him about.

To sum up: *if you do not know what the poison is, but there are signs of burning or caustic action about the mouth and lips, do not give an emetic,* give a tablespoonful of bland oil, such as olive oil or cottonseed oil, or castor or cod-liver oil; get the patient to bed, relieve his pain, put mustard plaster over the stomach, and try to keep him alive. You do not give an emetic in such cases because the burned stomach might give way in vomiting, and the caustic would burn as much coming up as it did going down.

If you do not know what the poison is, but the lips and mouth are not burned, give an emetic followed by two or three raw eggs, a glass of milk, or flour and water, and then a cup of strong, hot tea, after which relieve pain and obviate the tendency to death.

When you do know the poison give the emetic, and the antidote; then relieve pain and keep the patient alive.

Common Poisons. Among the substances which most commonly cause poisoning are phenol, opium, wood alcohol, foods, chloral, arsenic, corrosive sublimate, nitrate of silver, phosphorus, and strychnine.

Phenol is usually taken in concentrated form, and may produce death in an hour or two. The symptoms are white patches on the lips, burning pain in the stomach, intense depression, cold clammy skin, weak pulse, failing respiration, stupor, and death. The antidotes are the soluble sulphates and albumen, but they cannot be depended upon. Give emetics, then wash out the stomach thoroughly with water containing about two ounces of Epsom or Glauber's salts, then give two raw eggs or a pint of milk. Perform artificial respiration and use stimulants, heat and rubbing.

When phenol is dropped on the skin, alcohol, if used promptly, will completely prevent any burning.

Opium. The treatment of opium poisoning has been previously described.

Wood alcohol or *methyl alcohol* is a very dangerous poison used as a fuel, and in the manufacture of toilet preparations such as bay rum. Unhappily, the advent of prohibition brought in its train a corps of *bootleggers* who surreptitiously and unlawfully peddle alleged whisky or other beverages which contain wood alcohol as the basic source of the "kick." The kick is frequently fatal to those who chance drinking these concoctions. Shun all such *"booze."*

The symptoms of poisoning by wood alcohol are severe pains in the head and abdomen, dizziness, vomiting, delirium, partial or complete blindness, dilated pupils, great depression of the heart and respiration, sometimes albuminuria, stupor, and death. If the patient recovers he is often left blind.

The treatment consists in use of emetics, or washing out the stomach, emptying the bowels by cathartics and enema, active stimulation by *good* whiskey and coffee internally, and strychnine hypodermically; artificial respiration if necessary, and external warmth.

Ptomaine poisoning is usually due to the use of foods which have undergone partial decomposition, though there may be no change in their taste or odor. The poisonous decomposition is especially apt to occur in hashes, milk, or foods containing milk which have been kept over night in warm weather. Sausage, cheese, and shell-fish sometimes undergo the same changes. Many cases of poisoning of this kind have occurred at military posts; sometimes whole companies have been poisoned at the same time.

The symptoms are much like those of wood-alcohol poisoning, only vision is not usually affected and there may be some fever and some purging.

In treatment the first thing to do is to empty the stomach and bowels of the poison by the use of emetics and active cathartics. Then relieve pain and give stimulants, with heat externally, and mustard plasters over the abdomen.

Chloral is the drug usually employed to make the *"knockout drops"* used in brothels and other places of ill-repute. It causes deep sleep followed by insensibility, with failure of the heart and sometimes the respiration. Empty the stomach and keep the patient awake by the same means as in opium poison, except that on account of his weak heart the patient must not be made to walk about as in opium poisoning, and for the same reason strychnine must be freely used hypodermically.

In *arsenic poisoning* there is great pain in the abdomen, with vomiting and purging, tenderness, straining and perhaps suppression of urine, severe depression and anxiety, weak, rapid pulse, and cold, clammy skin. Use emetics or the lavage tube, give a tablespoonful of freshly prepared *hydrated oxide of iron* every ten minutes for five or six doses. The hydrated oxide is prepared by precipating the tincture of the chloride of iron with aqua ammonia, and washing the precipitate to remove the excess of ammonia. Then give morphine, stimulants, and soothing drinks, with external heat and friction.

Corrosive sublimate may be swallowed by mistake in the form of an antiseptic solution. The symptoms are about the same as in arsenic poisoning and the treatment is much the same except that the *antidote is albumen* instead of hydrated oxide of iron, and that the antidotal effect is only temporary, so that emetics must be used after the antidote.

Nitrate of silver may be swallowed accidentally as when a piece of lunar caustic breaks off and drops down the throat. Common table *salt dissolved in water* should be given freely; it is at once a special antidote and an emetic.

Phosphorus is sometimes taken in the form of match-heads. It is an irritant poison like arsenic and corrosive sublimate. *Sulphate of copper is the antidote* and also an emetic; it should be given one-fifth of a gram, every five or ten minutes, with tepid water.

Phosphorus is the one irritant mineral poison for which oils should not be given because its absorption is favored by them.

Strychnine causes violent convulsions, with intervals of rest; there are also pains and cramps in the abdomen. Death is the result of asphyxia in the convulsions, or exhaustion following them. *Use emetics* or the lavage tube, *bromides* and *chloral; chloroform.*

Substances which produce poisoning when applied to the skin are chiefly plants of the *rhus family* such as "poison oak," "poison ivy," and "poison sumac." Other plants such as the common garden parsnip produce poisoning occasionally.

Some persons are not susceptible, while other persons are so much so that they appear to be poisoned even without actual contact. "Poison oak" is a stubby plant, with three leaflets *notched* on the edge and *downy* on the under surface; "poison ivy" climbs on rocks and trees; it is distinguished from "Virginia creeper," which it resembles, by having three leaflets instead of five, and by having a hairy trunk and little clusters of white berries; "poison sumac" is distinguished from the harmless variety by having white berries instead of red. The symptoms of *rhus poisoning* are an inflammation of the skin closely resembling erysipelas; redness, swelling, burning and itching, sometimes vesicles; it is especially apt to occur on exposed parts such as the face and hands.

The treatment consists in dissolving off any remaining poison with alcohol, and then applying alkaline lotions, such as a saturated *solution of bicarbonate of soda.* Coating the eroded surface with a hot saturated solution of potassium permanganate is also very efficacious and soothing.

Transportation of Patients. Not only in first aid, but in their ultimate recovery, the proper transportation of the sick and wounded plays a very prominent role. Many useful and life-saving methods of gently handling the sick and wounded have been devised. All of them aim at getting the patient, as expeditiously as possible, in the best physical condition possible, to the place where proper treatment can be rendered.

The transport of patients is accomplished by the following means:

1. By men, without appliances, (e.g. across back);
2. By apparatus carried by men (e.g. litter);
3. By apparatus wheeled by men (e.g. litter carrier);
4. On animals (e.g. seated on led horse);
5. By apparatus carried on animals (e.g. pack);

6. By vehicles drawn by animals (e.g. ambulance, travois);
7. By mechanical means (e.g. motor ambulance, hospital train, airplane);
8. By water transport (e.g. river barges, hospital ships).

The exact method to be adopted depends entirely upon the local conditions, nature of the country and the facilities available. As the carriage of wounded by manpower always imposes a heavy strain on litter-bearers, other means of transportation should be substituted for manpower whenever available. Hospital ships, hospital trains, and ambulances have been previously described. Some of the expedients resorted to in the transportation of patients, as a part of First-Aid, now merit consideration.

Carriage by Men Without Litters. This may be "across back," "in arms," or "astride of back." *Across back.* Turning the patient on his face, the bearer steps astride his body, facing towards the patient's head, and with hands under his arm-pits, lifts him to his knees; then clasping hands over the patient's abdomen, lifts him to his feet. He then, with his left hand, seizes the patient by the left wrist and draws his left arm around his (the bearer's) neck, and holds it against his left chest, the patient's left side resting against his body, and supports him with his right arm about the waist. From this position the bearer, with his right arm around the patient's back, passes his left under his thighs and lifts him into position, carrying him well up. (Fig. 115).

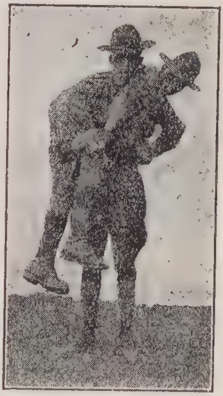


Fig. 115.—Carrying Patient Across Back. For long carry, patient's body should cover more of bearer's right shoulder.

"In arms" requires no description. Common sense dictates the best method.

In carrying the patient astride of back, we simply resort to the old "Pick-a-back" of our childhood days. If the patient is unconscious, this method is of course impracticable.

Carriage by Two Bearers without Litters. Raising the patient to a sitting posture, one bearer clasps him from behind around the body under the arms, while the other bearer standing between the legs, passes his hands from the outside under the flexed knees. In this method both bearers are facing toward the patent's feet. It requires no effort on the part of the patient but is not applicable to severe injuries of the extremities.

Carriage by Men with Litters. Two types of litters are used by the Army, a standard *canvas* litter for general use, and a *metal* litter for special use in airplanes, trenches, dug-outs, on ships, and under conditions where free movement is restricted and the canvas litter does not satisfactorily meet the requirements.

The standard canvas litter (Fig. 116), is collapsible and consists of a canvas bed 6 feet long and 22 inches wide, made fast to two poles 7½ feet long, and stretched by two jointed braces. The ends of the poles form the handle 9 inches long, by which the litter is carried. The fixed iron legs are stirrup-shaped, 4 inches high and 1¾ inches wide. On the left front and right rear handles a half-round iron ring is fixed, 4½ inches from the end; between this and the canvas plays the movable ring of the sling. One pair of slings is permanently attached to each litter. They are made of khaki-colored webbing, 2½ inches wide, with a leather-lined loop at each end and a slide to regulate the length. One loop of the sling passes through a metal swivel, itself attached to the movable ring of the handle. Weight of litter, about 22 pounds.

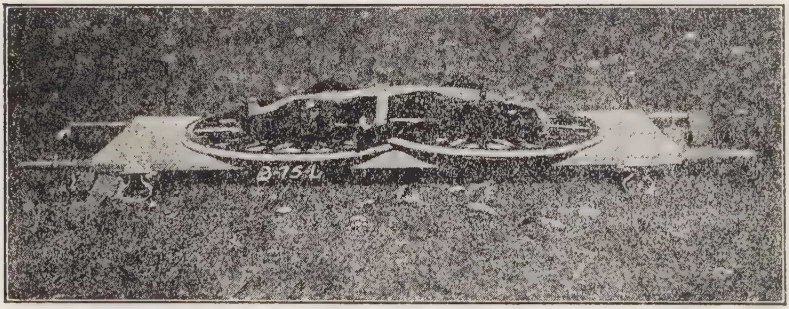


Fig. 116.—U. S. Army Canvas Litter. A wheeled litter carrier (Fig. 118), in collapsed position, is shown on top of open litter.

The special metal litter (Fig. 117) is approximately 7 feet long, 23 inches wide, 8 inches deep, and weighs about 20 pounds. The litter consists of a rigid frame of light steel tubing, with wire mesh netting attached to form the bed. The upper section of the litter is about 45 inches long and has light wooden slats inserted in the floor. The lower section is divided by a ridge into two leg troughs. Permanently attached to the litter are five web straps 60 inches long, with buckles and keepers for securing the patient in the litter. This litter is not collapsible, but is so constructed as to permit of easy nesting.

Improvised Litters. Many things can be used for *this purpose,* such as camp cots, window shutters, doors, benches, ladders, etc., properly padded.

Litters may be made with sacks or bags of any description, if large and strong enough, by ripping the bottom and passing two poles through them, and tying two crosspieces to the poles to keep them apart. Two or even three sacks, placed end to end on the same poles, may be necessary to make a safe and comfortable litter.

Bedticks are used in the same way, by slipping the poles through holes made by snipping off four corners.

Pieces of matting, rugs, or carpets trimmed into shape may be fastened to poles, by tacks or twine.

Straw mats, leafy twigs, weeds, hay, straw, etc., covered or not with a blanket, will make a good bottom over a framework of poles and cross sticks.

Better still is a litter with a bottom of ropes or rawhide strips whose turns cross each other at close intervals.

Litters may also be improvised by lashing two short poles, about 2 feet long, across two long poles, with bandages or other materials, and securely lashing a blanket, shelter half, or poncho over this; or rope, wire, or other similar material may be woven between the poles and this network covered with a blanket.

The usual military improvision is with blankets or shelter tents, and poles about 7 feet long. The blanket is spread lengthwise on the ground. One pole is laid across the center of the blanket, which is then folded over it. The second pole is placed across the center of the new fold and the blanket is folded over the second pole as over the first. Should it be desirable, the following method may be used: One half of the blanket is rolled lengthwise into a cylinder which is placed along the back of the patient who has been turned carefully on his side. The patient is then turned over upon the blanket and the cylinder unrolled on the other side. The poles are then laid down and rolled tightly in the blanket, each a like number of times, until the side of the body of the patient is reached.

A litter may also be prepared with two poles and two or three blouses. By turning the blouses inside out and buttoning them up, sleeves in, and by passing the poles through the sleeves, the backs of the blouses form a bed.

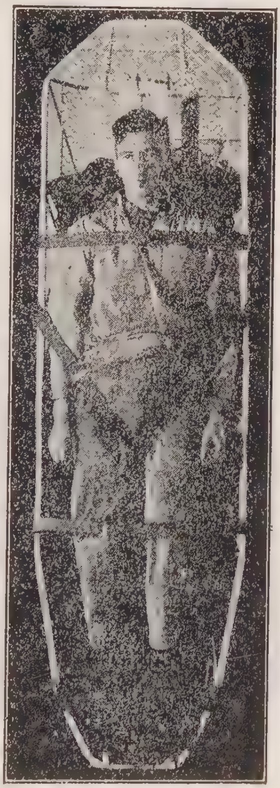


Fig. 117.—U. S. Army Metal Litter. For airplanes, trenches, etc.

General Rules of Carriage on Litters. As a rule the patient should be carried on the litter feet foremost, except in going up hill or up stairs, when his head should be in front.

In cases of fracture of the lower extremities he should be carried up hill or up stairs feet foremost, and down hill head foremost to prevent the weight of the body from pressing down on the injured part. In passing obstacles or ditches the litter must always be kept level at all times. The patient should be placed on the litter in a position that will assure the most comfort, depending upon the type of injury from which he is suffering. In most cases the head should be kept low and not press forward on the chest. In wounds of the abdomen the patient should be laid on his back with his legs drawn up and a pack or other article placed under his knees to keep them bent. Before placing a patient on a litter, it should be covered with a blanket folded lengthwise, so as to keep him warm and thus reduce liability to shock. Another blanket or his overcoat is thrown over the patient. A pillow or an improvised one, such as part of his pack, can be placed under the patient's head, provided that it does not unduly raise it. In cold weather, in cases badly shocked, hot-water bottles or improvised ones such as canteens filled with hot-water, should be placed about the patient. For short distances litters can be carried by two bearers, but for the appreciably long distances commonly necessary in the field, four bearers should be used. When four bearers are employed the poles are frequently placed on the bearers' shoulders. The metal litter adapts itself admirably to trenches and similar conditions. The trough acts as a good splinting surface, and when all the containing straps are used the patient is so securely bound that the litter can be stood up on end without causing any discomfort to the patient.

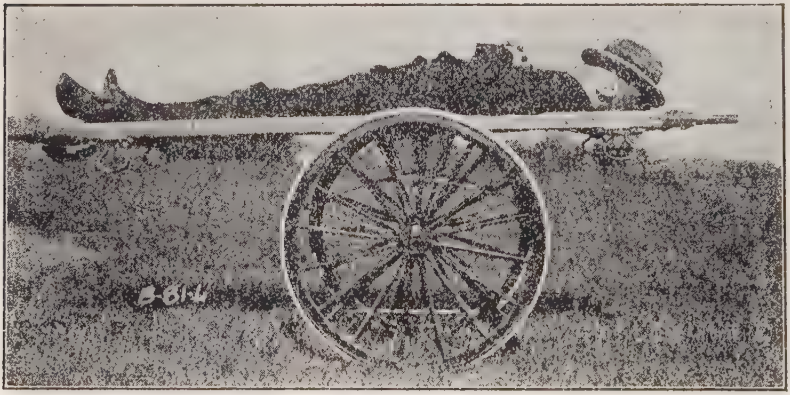


Fig. 118.—Wheeled Litter Carrier, Collapsible Type (See Fig. 116). Litter is quickly attached. Carrier may be folded and hung on back of a vehicle.

Wheeled Litter Carriers. These are extremely useful in the field, especially where the roads are good. Two types have been adopted by the Army, a heavy non-collapsible type drawn by two men and not very popular because of the hard work entailed in pulling them, and a much lighter collapsible type (Fig. 118), which is extremely popular and well adapted for front-line work in relieving litter bearers of the necessity for carriage of litters by hand.

Carriage by Pack Outfits. In the U. S. Army this means of conveyance has been but seldom if ever employed. In some of the foreign armies, as in Africa and other places where wheeled transport could not be utilized, they have met the need in a fairly satisfactory manner.

A bed-like arrangement for a lying patient, suitably balanced, can be suspended from each side of the pack saddle, or what is infinitely better, our metal litters (Fig. 117) may be used for this purpose. For sitting patients, folding chairs or any apparatus which approximates their structure, may similarly be hooked in pairs to the sides of a pack saddle, the patients sitting on each side facing the direction of the animal's head. These forms of conveyances are termed *Cacolets*. Litter supports may also be rigged up between two docile animals, in tandem fashion.

Carriage by Animal-drawn Vehicles. In addition to the standard ambulances, any other type of vehicle makes a satisfactory substitute in an emergency. The escort or similar wagon may be used, provided that a plentiful supply of straw, hay, dried leaves, or similar material, is liberally strewn over the floor to support the litters and provide the resilience necessary in negotiating rough going.

Two-wheleed carts, with narrow gauge, a type which is now being studied with a view to development in our equipment laboratory, offer some advantages in mountainous regions and over other terrain impassable to standard vehicles. A sand sled or skid, drawn by a mule, can be quickly improvised. In winter, the advantageous use of sleighs and sleds must also be borne in mind.

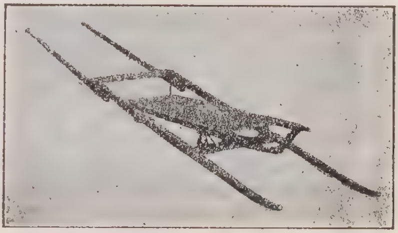


Fig. 119.—Travois, Constructed Type. One can be readily improvised.

The *Travois,* (Fig. 119) a legacy from our American Indians, and utilized by them in transporting their effects across country, can be used for transporting the sick or wounded when the employment of wheeled vehicles or other means of transportation is impracticable. The travois consists of two long poles, one end of which is attached to the side of a horse, like a shaft, while the other end drags on the ground. Behind the horse, crossbars extend between these poles, holding them parallel and affording support for a patient.

A travois may be improvised by cutting poles about 16 feet long and 2 inches in diameter at the small end. These poles are laid parallel to each other, large ends to the front, and 2½ feet apart; the small ends about 3 feet apart, and one of them projecting about 8 or 10 inches beyond the other. The poles are connected by a crossbar about 6 feet from the front ends and another about 6 feet back of the first, each notched at its ends and securely lashed at the notches to the poles. Between the crosspieces the litter bed, 6 feet long, is filled in with canvas, blanket, etc., securely fastened to the poles and crossbars, or with rope, lariat, rawhide straps, etc., stretching obliquely from pole to pole in many turns, crossing each other to form the basis for a light mattress or an improvised bed; or a litter may be made fast between the poles to answer the same purpose. The front ends of the poles are then securely fastened to the saddle of the animal. A breast strap and traces should, if possible, be improvised and fitted to the horse. On the march the bearers should be ready to lift the rear end of the travois when passing over obstacles, crossing streams, or going up hill.

Carriage by Motor Vehicles. Any type of motorized vehicle used by the Army in the field makes a satisfactory substitute for our standard motor ambulance. Sightseeing busses, when they become available during occupation of a certain territory, are particularly useful in evacuating groups of slightly wounded long distances.

Motor trucks always constitute an important reserve. When properly bedded down with straw or other material, a 3-ton truck will carry 24 patients sitting, the men sitting with their back to the sides, feet toward the center, and any arms or equipment piled at the rear. Without litters it will carry 8 lying down on the straw, in two rows of 4 each, one row with their heads toward the front and the other row with heads toward the rear; or 8 lying across the floor. With litters, 3 can lie on them towards the front, with space at the rear for 4 sitters. If properly supported an upper tier of 3 more litters can be carried across the sides of the truck.

Vehicles of the caterpillar or tank type, able to pass over even the worse kind of going, are a great asset when they can be commandeered for the emergency evacuation of the sick and wounded.

CHAPTER XV

DEFENSE AGAINST CHEMICAL WARFARE

Introduction. In a treaty signed in 1922 the United States, British Empire, France, Italy and Japan agreed not to use in war "asphyxiating, poisonous, or other gases, and all analogous liquids, materials, or devices." The object therefore, of training in defense against chemical warfare is to prepare the Army of the United States to resist with a minimum of casualties any attack that may be made against it by an enemy employing noxious gases of other chemical agents.

To deal successfully with chemical warfare casualties, it is necessary to possess a general knowledge of the uses of chemical weapons and an accurate knowledge of the injuries which may be thereby produced.

Limitation of Apparatus. The apparatus used by our Army for protection against gas is a compromise between absolute protection and practical consideration in regard to its use in the field, such as maximum comfort, lightness, and simplicity. The amount of protection actually attained varies according to the chemical agent used, being high in the case of those which attack the lungs only, but only moderate in the case of those which attack the skin and other parts of the body.

Gas Discipline and Training. Gas attacks properly executed will always cause some casualties. The object of gas discipline is to reduce these casualties to a minimum. Chemical warfare depends for its greatest success on surprise, and it is especially effective against poorly trained troops. There is a striking difference in gas casualties between troops which have good gas discipline and those which have not. The state of gas discipline of a command is an excellent indication of general training and efficiency.

Chemical Agents. The term chemical agent includes those chemicals and chemical compounds, whether gases, liquids or solids, used in chemical warfare.

GILCHRIST'S CLASSIFICATION OF WARFARE CHEMICALS ACCORDING TO:

1. **Physical State:** A. *Gases,* Chlorine (Cl), Phosgene (CG) ; B. *Liquids,* Dichlordiethylsulphide (Mustard or HS), Chlorvinyldichlorarsine (Lewisite or M1), Chlorpicrin (PS) ; C. *Solids,* Diphenylchlorarsine (DA), Diphenylaminechlorarsine (DM), Chloracetophenone (CN).

2. **Tactical Uses:** A. *Direct Casualty Agents,* (Phosgene, Mustard, Chlorpicrin); B. *Harassing Agents,* (Diphenylchlorarsine, Chloracetophenone); C. *Screening Agents,* (Phosphorus, Smoke Mixtures); D. *Incendiary Agents,* (Phosphorus).
3. **Physiological Effects:** A. *Lung Irritants,* (Phosgene, Chlorine, Chlorpicrin); B. *Sternutators,* (Diphenylaminechlorarsine, Diphenylchlorarsine); C. *Lachrymators,* (Brombenzylcyanide, Chloracetophenone); D. *Vesicants,* (Mustard, Lewisite); E. *Direct Poisons to Nervous System* (Hydrocyanic acid); F. *Interfering with Respiratory Properties of Blood,* (Carbon Monoxide).
4. **Persistency:** A. *Persistent Chemicals,* (Mustard, Lewisite); B. *Non-Persistent Chemicals,* (Chlorine, Phosgene).

Tactical Value. Gas is employed to disable personnel, reduce its fighting efficiency, or interdict areas to occupation or passage of troops, and only very slightly to destroy or damage material; smoke is employed to screen our own forces and to blind those of the enemy.

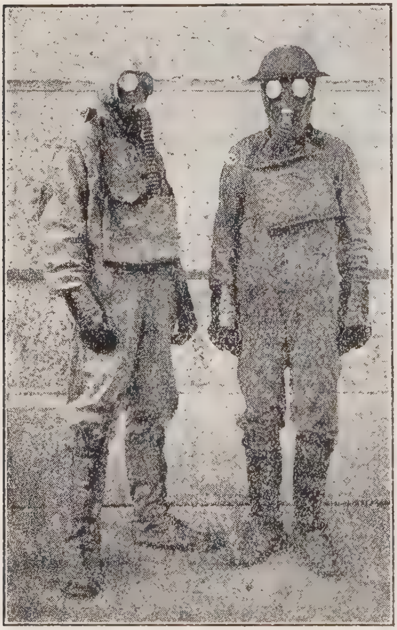


Fig. 120.—Gas Mask and Protective Clothing worn by soldiers working in gassed areas and attending certain classes of gassed patients.

Methods of Employment. Gas is employed in combat by means of artillery projectiles; airplane bombs and devices; liquids and bombs placed in position; light mortar projectiles; gas candles and cylinders; projector bombs; and similar equipment and material.

The Gas Mask. The gas mask (Fig. 120) is the fundamental apparatus for individual protection. It gives practically perfect protection against all chemical agents which attack the lungs and eyes. It also mechanically protects that part of the face which it covers. Obviously, it does not furnish protection to the body from chemical agents of the mustard type.

Material for Collective Protection. This includes gas-proof shelters which are usually unsatisfactory, alarm devices, chemicals for destroying chemical agents, mobile bathing units, and protective covers or containers for matériel.

Procedure During a Gas Attack. As soon as it has been established that a gas attack is in progress, the alarm should be given by all means available. Masks are adjusted, doors of gas-proof shelters are lowered and fires are put out whenever such shelters exist, *matériel* is protected and, in general, all routine measures of individual and collective protection are carried out. Casualties are removed from the gassed area as soon as possible and first-aid treatment given.

Effects of Chemical Agents on The Human Body. The symptoms produced by chemical agents depend to a certain extent upon the chemicals and concentrations used, the length of exposure, physical condition of the person affected, and the manner in which he conducts himself after being exposed. The various chemicals used in warfare have an especial effect on some particular part of the body, and based upon this they are classified accordingly. It must be remembered that several chemicals, each affecting different parts of the body, may be used at the same time, thereby producing a variety of symptons. According to their principal action on the body, chemical agents are classified as follows:

Action	Gas
Lung irritants ("Coughers")	Phosgene Chlorine Chlorpicrin
Sternutators ("Sneezers")	Diphenylaminechlorarsine. Diphenylchlorarsine
Lachrymators ("Weepers")	Brombenzylcyanide. Chloracetophenone.
Vesicants ("Blisterers")	Yperite (mustard gas). Lewisite.
Direct poisons of the nervous system ("Paralyzers")	Hydrocyanic acid gas.
Gases interfering with the respiratory properties of the blood ("Suffocators")	Arseniureted hydrogen. Carbon monoxide.
Incendiaries ("Burners")	White phosphorus. Thermite. Spontaneously inflammable liquids. Solid oils.

Several of these groups are relatively unimportant. The lachrymators and sternutators are not lethal, and as used in the field rarely cause any but very temporary ill effects; while direct poisons of the nervous system and gases interfering with the respiratory properties of the blood have not been used in the field with any degree of success. The lung irritants and the vesicants are most important, as the gases of these groups have been responsible for practically all deaths and the great majority of the casualties.

Lung Irritants. The main symptoms of poisoning by these lung irritants may be summed up as follows:

(1) Catching of the breath, choking, and coughing immediately upon exposure to gas.

(2) Inability to expand the chest in a full breath after removal from the poisoned air.

(3) Vomiting, hurried shallow respiration or breathing; sometimes coughing with an abundant expectoration; pain is felt behind the sternum or breast-bone and lower part of the chest.

(4) The patient gets blue in the face, or in severe cases, may go on to the gray condition which is very serious. With both of these conditions, there will be a lack of circulation of blood.

Sternutators. These cause sneezing and irritation of the nose and throat, even in very low concentrations, without causing any material effect on the lungs.

Lachrymators. Extremely low concentrations exert an intense irritant action on the eyes, and cause so profuse a flow of tears and so much discomfort that vision becomes impossible.

Vesicants. These cause inflammation and blistering of the skin, associated with acute conjunctivitis (inflammation of the eyes) and intense inflammation of the respiratory passages. On exposure to mustard vapor or to a finely atomized spray of mustard liquid, nothing is noticed at first save the faint, though characteristic, smell (garlic or skunk).

After the lapse of two or three hours, the eyes begin to smart and water, and they soon become reddened. The nose also runs with thin mucus, as from a severe cold in the head, and sneezing is frequent. (Earlier sneezing in the field after exposure to gas shell is probably due to the simultaneous use by the enemy of diphenylchlorarsine.) Nausea, retching and vomiting, associated with stomach-ache, commence at about the same time as the pain in the eyes, and they recur in attacks at frequent intervals for several hours.

During the next few hours, the conjunctivitis increases in intensity and the vessels are deeply injected. The throat feels dry and burning; the voice becomes hoarse, and a dry, harsh cough develops. Imflammation of the skin now shows itself in a dusky redness of the face and neck, which look as though they had been scorched or sunburned but are almost painless; while the inner surfaces of the thighs, genitals, and other sheltered parts of the body are similarly affected. This is rapidly followed by the development of small blisters in the same areas.

At the end of 24 hours a typical appearance is presented. The main distress is caused by the pain in the eyes, which may be very great. The patient lies virtually blinded, with tears oozing from between bulging eyelids over his reddened and slightly blistered face, while there is a constant nasal discharge and an occasional harsh, coarse cough. The respiration is fairly normal both in rate and depth. There may be frontal headache, associated with pain in the eyes, and photophobia (inability to bear light) is always a marked symptom. Death practically never occurs during the first 24 hours.

During the second day the condition is aggravated by blisters in the reddened areas increasing in size, while the scrotum and penis become enlarged and painful. Bronchitis now sets in, with abundant expectoration of muco-pus, in which there may be found large pieces from the inflamed lining of the windpipe. The temperature, pulse rate, and respiration rate are all increased. Secondary infections of the mucous membrane in the respiratory tract soon lead to the development of a bronchial-pneumonia, the skin becoming blue and the heart being affected.

Death may occur from the second or third day, to the third or fourth week in the more lingering cases.

The effects of *Lewisite* are similar to those of mustard in producing inflammation of all parts of the body with which it comes in contact. Lewisite contains arsenic and in addition to its blistering action this arsenic is absorbed by the skin and thus may produce an acute form of arsenical poisoning. If a sufficient amount is absorbed, as may happen if the liquid is splashed on the skin, it will cause death if untreated. Lewisite is perhaps even more powerful than mustard gas as a vesicant, and the symptoms appear more rapidly after application. But Lewisite is more easily destroyed, as it forms a new compound with water, and hence will not be as persistent as mustard gas.

The vesicant group of chemicals is distinguished from the irritants by the persistency of their action. Ground sprinkled with them may be dangerous for days or weeks following. However, while the number of casualties will vary with the density of the concentration, terrain, weather, time of exposure, etc., the death rate is relatively low.

Direct Poisons of the Nervous System. In sufficient concentrations, these act with great rapidity, causing a cessation and finally a total abolition of the function of the central nervous system.

Gases Which Act by Interfering with the Respiratory Properties of the Blood. These may act in various ways. Thus, arseniureted hydrogen causes destruction of the red corpuscles of the blood, often resulting in a disease called jaundice; some gases cause decomposition of the normal coloring matter of the blood (*hemoglobin*). Carbon monoxide takes the place of oxygen in combining with hemoglobin.

Incendiaries. Burns received from these substances are ordinary heat burns, but they may be very severe. White phosphorus may be scattered on the body or even driven into the flesh by explosion of containers of this substance.

Prevention and First Aid Treatment of Casualties Produced by Chemical Agents. *General.* Inasmuch as all chemical agents are heavier than air and therefore naturally settle in shell holes and depressions in the earth and in dugouts, trenches, etc., it is a most important measure in the prevention of casualties to seek *high ground* and *open spaces* which are free from gases.

In moving out of a gas cloud, it is best to proceed cross wind. If a gas cloud envelopes a building, close all doors and windows tightly, put out all fires, plug all chimneys, and go to the upper floors of the building. The most effective way to prevent the effects of chemical agents on the eyes, face, and respiratory system is the prompt use of the gas mask. The mask must be adjusted to the face at the first odor of any gas. It must be worn until it is ordered removed by an officer or noncommissioned officer of the unit.

In the absence of a gas mask, the prevention of the breathing of toxic gases may be accomplished to a certain extent by the following emergency means: Breathe through a handkerchief saturated with urine or a solution of baking soda or soap suds. If impossible to obtain a handkerchief, any clean cloth or piece of cotton will serve the purpose.

Lung Irritants. First-aid treatment for these gases is directed toward conserving the supply of oxygen in every way. *Rest.* The importance of absolute rest can not be exaggerated. Rest reduces the need for oxygen to probably one-fourth of the amount required to walk to the rear, and many men have died as the result of attempting to walk to a distant aid station. The man must lie down and remain at rest with his equipment removed and his clothing so loosened that he can breath freely.

All gassed cases should be evacuated as soon as possible to a point at which arrangements have been made for effective treatment, bearing in mind that cases gassed by lung irritants should not walk. They are litter and ambulance cases. *Warmth.* The greatest care should be taken to keep these cases warm, especially if clothing is partly removed. If the patient is cold, his oxygen requirement may be doubled. Wrap him in blankets and give him hot coffee if it is available. This not only supplies heat, but is a mild cardiac stimulant. *Oxygen.* The effects of the administration of pure oxygen are magical. The man may be cyanosed (blue) and gasping for breath, yet a short time after breathing pure oxygen his color becomes normal and his breathing easier, and he may even fall asleep. When the oxygen is removed, patients beg to have it returned. Cylinders of oxygen are fitted with proper face pieces and reducing apparatus so that pure oxygen may be breathed at atmospheric pressure. The Haldane apparatus was commonly used during the World War. In future cases ambulances should be supplied with cylinders of oxygen and apparatus for its administration, and oxygen will be available at aid stations. This comprises all possible first-aid treatment, and if properly applied will save all except the most serious cases. The medical officer will have other treatment for such cases, including bleeding, cardiac stimulants, and other measures; but immediate rest and the prompt application of warmth and, if possible, oxygen are the most important factors in the treatment. Alone these measures will save many cases, and even the more serious cases will reach the hospital in comparatively good condition, instead of being practically moribund.

Sternutators. Wash the nose and throat with saturated boric acid solution, or simply saline solution, which can be prepared by adding a teaspoonful of common salt to a pint of water. Relief is also afforded by inhaling the following mixture:

Alcohol	40 per cent.
Chloroform	40 per cent.
Ether	20 per cent.

(5 to 10 drops of ammonia.)

Lachrymators. The most powerful gases, and those most frequently used, are chloracetophenone and brombenzylcyanide. Neither of these gases is poisonous in concentrations that can be put in the field, and the mask is a perfect protection against them. Even when the mask is not available, they cause no permanent injury to the eyes. Hence very little treatment is required for tear gas. The eyes may be washed out with a saturated boric acid solution, or with a 2 per cent solution of sodium bicarbonate. Chloracetophenone causes a burn when applied in powder form to the skin. Sodium bicarbonate solution has been found to be a soothing application for such burns, which are seldom severe. Do not rub the eyes after lachrymation, but simply face the wind and open the eyes as much as possible. Sometimes blowing the nose assists. The eyes must not be touched, as this will increase the irritation.

Vesicants. When it is known that vesicants or blistering chemicals have been used by the enemy, all troops in the affected areas should wear protective clothing (Fig. 120) in addition to the gas mask. Care must be taken not to allow mustard liquid to come in contact with the skin or clothes. When unprotected troops are exposed to mustard gas, the following measures should be taken to prevent burns:

Remove all clothing and equipment.

As quickly as possible, sponge the affected parts of the body with water or kerosene. If kerosene is not available, gasoline from an automobile may be used if due care is exerted to prevent fire. Alcohol may also be used if available. The kerosene or other organic solvent is then wiped off with a clean cloth, and more uncontaminated solvent is applied. The area is then rubbed thoroughly with the hand. Every minute or two the solvent is removed from the skin and hand by a clean cloth. If all mustard is not removed by this repeated cleansing, the burnt area may spread. The rubbing and removal of contaminated solvent should be continued or about 30 minutes, and the parts then thoroughly washed with hot water and tincture of green soap.

Should those solvents not be available the following method may be used: Wash the affected parts as promptly as possible with an aqueous solution of chloride of lime or with Dakin's solution. (Dry chloride of lime should not be used as considerable heat is generated when the mustard is chlorinated.) After this has been thoroughly applied, wash well with hot water and tincture of green soap. Wash out the eyes with a solution of 2 per cent bicarbonate of soda, with a saturated solution of boric acid, or with plain water, if that is all that is available. Open the eyelids wide, and flush thoroughly, paying particular attention to the cornea (the transparent anterior portion of the eyeball). Inflammation of the cornea may result in a loss of transparency and impairment of vision.

Don't bandage the eyes. Pressure bandages over the eyes lock up the lids and retain the secretions, which after a term of hours may become purulent. The nose and throat should be thoroughly cleaned with the bicarbonate solution or plain water. Do not swallow it.

All of the above solutions and chemicals for treating mustard burns should be kept at aid stations or with degassing units at the front. Casualties may be reduced to a minimum by the methods outlined.

If *Lewisite* has been used by the enemy, the following measures should be taken to prevent burns. Clothes sprinkled with Lewisite should be removed at once as in the case of mustard gas. Lewisite should be removed from the skin as promptly as possible, if a bad burn is to be avoided.

Lewisite is entirely destroyed by an alkali like a 5 per cent solution of sodium hydroxide or ordinary caustic soda. Those who handle this liquid should always have the solution close at hand. The Lewisite is thoroughly sponged off with the 5 per cent solution of sodium hydroxide, and this in turn must be well washed off with soap and water, as it is itself irritating. If sodium hydroxide solution is not available, immediate washing with soap and water is the best available treatment. All soap contains a little alkali, which with water breaks up Lewisite though more slowly than alkali. After 15 minutes a considerable amount of Lewisite has been absorbed and the treatment is less effective and will not entirely prevent a burn.

The use of protective gloves and clothing (Fig. 120) by all who come in contact with mustard-gas patients should be strictly observed. Chloride of lime should be spread on the ground contaminated with mustard gas, near headquarters, or crossroads, or where troops frequently pass. The liquid mustard should first be covered with earth to absorb it, before spreading on the chloride of lime. Then the chloride of lime should be covered with earth to prevent its appearance in aerial photographs. Soldiers and others coming in contact with animals exposed to the fumes of mustard gas must always bear in mind that the hair on these animals retains the gas and may be the means of producing severe gas casualties among those coming in contact with them.

The degassing of clothing and other materials which have been contaminated with chemical agents, particularly with mustard gas, must be accomplished with caution by those employed in the work. They must use gas masks, rubber gloves, and protective clothing when gas is present or is suspected.

There are two general methods of removing poisonous gases from clothing and other materials, viz., chemical and physical. The chemical method consists of soaking the articles when practicable in a solution of one of the following: Chloride of lime, chlorine, alkaline soap, or sodium bicarbonate. The physical method consists in employing one or more of the following agencies: Moist heat, running water, steam under pressure, steam not under pressure, sunlight, and open air. The best method is sterilization with steam. Clothing and materials subjected to steam (either under pressure or not under pressure) for half an hour are rendered free from chemical agents.

Hydrocyanic Acid Gas. The first-aid treatment when this substance is used is a matter of minutes and consists of the removal of the patient to a free atmosphere. If possible, administer oxygen. The nervous reflexes and circulation should be stimulated by injection of ether or caffeine or by sprinkling the nape of the neck with cold water. The patient should be carefully watched later for signs of pulmonary oedema. If dyspnoea is manifested and cyanosis seems possible, blood letting should be immediately conducted.

Carbon Monoxide. Carbon monoxide intoxication results from the fixation of that poisonous gas by the hemoglobin of the blood. It may be counteracted by an excess of oxygen. Resort to artificial respiration after the patient has been removed from the contaminated atmosphere. Schaefer's method is best for this purpose. Friction should be applied in the region of the heart. For the accompanying thirst give hot coffee. Diet should be restricted to liquids. The administration of any of the headache remedies should be discouraged.

Incendiaries. For phosphorus burns, apply cotton or soft gauze wet with a 2 per cent solution of copper sulphate. Particles of phosphorus so treated become covered with a layer of copper and cease burning, and can be removed from the tissue by forceps. The copper-sulphate solution must not be applied for longer periods than three minutes. Further treatment is the same as for ordinary burns. Phosphorus will not burn under water, and if copper sulphate is not available, the affected part of the body should immediately be placed under water until further treatment may be obtained. Phosphorus melts at 112° F. so that if the part is placed in warm water, the phosphorus will melt and can be removed.

Thermite burns are not common. When they occur, the melted iron formed in the reaction can be chilled in a similar manner by water. For the other incendiaries, the first-aid treatment of all these burns is the same. The objects are first to protect from the air, which greatly aggravates the pain; secondly, the prevention of infection. If the skin is merely reddened, soft cloths soaked in a saturated solution of sodium bicarbonate should be applied. In the absence of this, any fresh oil, like olive oil, may be used.

When *blisters* have formed, they should be left undisturbed unless they are so full as to be painful, when they should be punctured with a needle that has been flamed to sterilize it. Severe burns may be dressed with sterile gauze wet with a warm saturated solution of boric acid or a solution of picric acid 10 parts in 80 parts of alcohol and 1,000 parts of water. Picric acid relieves the pain and is also an antiseptic. Over the gauze, place a thick layer of sterile absorbent cotton. Stimulants and hot drinks may be given internally to relieve shock.

Evacuation of Gas Casualties. In the evacuation of a gassed patient from front to rear the following summarized measures should be employed:

At aid stations: Examine mask and if gas abounds retain it on patient. Remove equipment and loosen clothing. Remove clothing if it is contaminated with mustard gas, and wrap in clean blanket. If affected with mustard gas wash eyes with soda bicarbonate solution (2%). Apply dressing to wounds produced by other war weapons. See that patient avoids unnecessary movement if suffering from a lung irritant. Keep him quiet. Encourage vomiting by giving tepid salt water, if safe to remove mask. Inspect emergency medical tag and make proper notation thereon. Expedite evacuation to collecting station.

At collecting stations: Change clothing and thoroughly bathe mustard cases if possible. Wash eyes of mustard cases. Completely demustardize whenever time and facilities permit. Adjust dressings. Give special treatment as indicated, including administration of oxygen, and bleeding in lung cases. Prepare patient for evacuation.

At special degassing stations: Administer neutralizing chemicals and degass clothing, by the group method.

At hospital stations: Sort. Classify. Segregate. Bathe. Retain critical cases for observation. Demustardize if not previously and thoroughly done. Bleed and administer oxygen as indicated. When fit for transportation evacuate to rear.

CHAPTER XVI

ADMINISTRATION OF MILITARY HOSPITALS

Introduction. The principles set forth below officially govern the administration of army hospitals. They are drawn up to cover chiefly the administration of general hospitals and the larger station hospitals. But in so far as applicable and practicable, they have equal force in the administration of all fixed hospitals, irrespective of their type or capacity. In a theatre of operations some deviation from the prescribed standard is to be expected, as hospital commanders must adapt themselves to local conditions. For further information on this general subject see AR 40-245, 40-580, 40-585, 40-590, 40-600, 40-605, and 40-610.

Titles Applicable to Duty Personnel. The following nomenclature is followed in designating the official position of Medical Department personnel performing the more important administrative and clinical duties at a hospital.

Duty	Title
Commanding hospital	Commanding officer.
In charge of a service	Chief of ....Service.
Commissioned assistant on a service	Assistant ....Service.
Officer in charge of records of sick and wounded	Registrar.
Officer in charge of a ward	Ward officer.
Commissioned assistant in a ward	Assistant ward officer.
Nurse in charge of a ward	Head nurse.
Principal enlisted assistant in a ward	Ward master.
Other enlisted assistant in a ward	Ward attendant.

General Duties of Commanding Officer. *General.*—The commanding officer of a hospital is responsible for its proper discipline and administration, including the care and preparation of the necessary reports, registers and records, as well as for the care and safeguarding of all public property which may come into his possession; for the proper expenditure of supplies and funds; and for the preparation of requisitions, returns and payrolls of the hospital. While the commanding officer is not charged with the execution of duties properly delegated by him to an assistant, yet he is responsible for exercising such supervision over duties thus delegated as to insure their prompt and efficient performance by the designated subordinate.

Patients. The commanding officer (or one of his commissioned assistants) determines what patients are to be admitted or discharged from the hospital. He provides for their assignment to wards or subdivisions according to the nature of their complaints, and is responsible for supervising their care and treatment, including the employment of recognized professional procedures.

The commanding officer or a commissioned assistant designated by him commands the detachment of patients. By his order and under his direction convalescent patients may be employed to perform such light duty in and about the hospital as may be of therapeutic value, or which may tend to improve their physical condition.

Information concerning the condition of sick and wounded patients necessary to allay the anxiety of friends may be freely imparted under instructions of the commanding officer.

When in the opinion of the commanding officer of the hospital the condition of a patient, by reason of injury or disease, has reached a stage which seriously endangers life the commanding officer promptly communicates the fact (by telegraph or otherwise, as he may deem necessary) to the person designated by the patient to be notified in case of emergency. In such cases the commanding officer also notifies the local Army chaplain.

For regulations relating to the furnishing of information which can be made the basis of a claim against the United States, see AR 35-7020. For regulations regarding reports of births, deaths, and cases of communicable diseases see AR 40–1025 and 40–1080.

Duty Personnel. As regards all duty personnel under his jurisdiction the commanding officer (or one of his commissioned assistants) commands them as a detachment commander. He assigns them to appropriate duties, and reports them on the proper returns in the capacity in which they are serving. He requires a proper performance of duty by the entire hospital personnel and prescribes and enforces proper regulations as to the sanitary, disciplinary, and other requirements of the hospital.

Inspections. Depending on its size, the commanding officer inspects or directs the inspection of the entire hospital daily, and on Saturdays inspects, or causes to be inspected, the detachment, Medical Department.

Hospital Property. The commanding officer does not permit hospital property to be used for other than Medical Department purposes.

Use of Hospital Buildings. The commanding officer of a hospital is responsible that no portion of the hospital buildings is occupied as quarters or used for maintaining a mess, except for patients and for personnel of the Medical Department (including civilian employees) on duty thereat.

Quarters and messes for officers on duty at the hospital may be permitted in rooms or buildings of the hospital set aside for the purpose, only when deemed necessary by the commanding officer of the hospital concerned.

When in the opinion of the commanding officer of the hospital it is impracticable for officers on duty at the hospital to maintain private messes, such officers may be subsisted in one of the established hospital messes, paying into the hospital fund for their subsistence an amount equal to that prescribed for officer patients in the same hospital, plus 25 cents a day each.

Fire Control. The commanding officer is responsible for instituting proper measures for the prevention and control of fire. These measures include the enforcement of fire-prevention measures prescribed by higher authority, the appointment of a competent fire marshal, the formulation of adequate regulations for fire prevention, periodic fire drill, etc.

Reports, Records, and Returns. The commanding officer is responsible for the proper and timely rendition of all reports and returns pertaining to his hospital and the official records thereof. See AR 40–1005.

Services. *General.* For convenience of administration, and in the interest of professional efficiency, the commanding officer of each Army hospital organizes the professional and other activities of his hospital into services after the manner of well-organized hospitals in civil communities. He prescribes the number of services for his hospital, the lines of control over them, and their relationship to each other.

List of Services. The following list, arranged alphabetically, represents the services customarily established in large hospitals, though considerable variation therefrom is left to the discretion of the commanding officer of the hospital concerned, who may create additional services under appropriate titles, when a necessity therefor exists:

Administrative.
Dental.
Eye, ear, nose, and throat.
Laboratory.
Medical.
Neuropsychiatric.
Nursing.
Orthopedic.
Physical reconstruction.
Röntgenological.
Surgical.
Urological.

Administrative Service. The administrative service of a fixed hospital includes such personnel and activities as the commanding officer of the hospital may prescribe. Personnel and activities as follows properly belong in the administrative service:

Personnel.

Commanding officer.
Executive officer.
Adjutant.
Personnel officer.
Registrar (including commander of detachment of patients).
Officer of the day.
Chaplain.
Chief nurse.

Activities.

Admission and discharge of patients.

Hospital inspection.
Detachment, Medical Department.
Hospital mess.
Fire control.
Summary court.
Recruiting.
Post Exchange.

Registrar. In the military service the office of registrar is peculiar to the Medical Department. The registrar has charge of all medical and surgical records and sees that careful and accurate clinical histories, statistical tables and charts, and all prescribed sick and wounded records are kept. He prepares all reports and returns pertaining to the sick and wounded. He, if the commanding officer does not assume direct command, commands the detachment of patients, and has charge of all records, accounts, and returns pertaining thereto. He is custodian of the money and valuables of patients in the hospital. He performs such other duties as may be prescribed by proper authority. With reference to signatures on sick and wounded cards, see paragraph 27, AR 40–1030.

Persons Who May be Admitted to Army Hospitals. All persons on active military service are entitled to admission. Under certain circumstances persons belonging to other governmental departments, such as the Navy, are also eligible. Beneficiaries of the U. S. Veterans Bureau are admitted to certain designated Army hospitals. The regulations also provide for the admission of certain civilians in governmental service, or who have had such service.

Disposition of Patients. *General.* Unless directed by higher authority, the commanding officer of a hospital does not order a patient discharged or transferred from the hospital until, in such commanding officer's opinion, the discharge or transfer in question would not endanger the life of the patient concerned. (For disposition of the insane see AR 600–500.)

Discharge to Duty. When a patient in hospital has sufficiently recovered from his disability to enable him to perform full duty, the commanding officer of the hospital sends such patient back to his organization, or makes such other disposition of him as may be directed by higher authority.

When the patient is to be returned to duty to an organization at such distance from the hospital as will require transportation for him other than such as may be furnished by the local commander, the commanding officer of the hospital makes request to the proper authority in advance for the necessary travel order, except that the travel orders for a patient in a general hospital are under certain conditions issued by the commanding officer of the hospital. (See AR 40–600.)

On the day that a patient who has been formally or informally transferred to a hospital (see AR 40–1050) is discharged to duty the commanding officer of the hospital notifies the patient's immediate commanding officer, in writing, through the surgeon of his station or command as follows:

The name of the patient.
The duration of his stay in hospital.
Whether or not the illness or injury treated was in line of duty, and,
Whether it was due to the patient's own misconduct.

Discharge to Quarters. In proper cases the commanding officer of a hospital may transfer patients from a hospital to a "quarters" status, notification in writing being forwarded as indicated above.

Discharge on Certificate of Disability. For discharge of patients on certificate of disability see AR 615–360.

Discharge. Persons other than those in the public service are, in the discretion of the commanding officer of the hospital, discharged from hospital upon completion of hospital treatment.

Transfer. Patients may be transferred, under proper military authority, from one hospital or medical control to another, for observation or to obtain better treatment or hospital accommodations. (See AR 40–600.)

Discharge from the Army for Cause other than Physical Disability. Patients discharged from the Army because of expiration of enlistment, or for other reason than physical disability, are ordinarily discharged from hospital; however, if the physical condition of the patient be such that he is physically unable to leave the hospital at the time of his discharge from the service he may be permitted to remain in the hospital until such time as the commanding officer of the hospital thinks he has sufficiently recovered to be discharged therefrom.

Death. For deaths occurring in hospitals, see below.

Desertion. Enlisted patients who desert the service while in the hospital are dropped from the rolls of the hospital and their company or detachment commanders notified of the action taken.

Patients' Effects. *General.* These provisions have particular application to and are intended to cover the ordinary requirements of peace-time conditions. In time of war, when large numbers of patients are being received daily, strict adherence to the procedures herein prescribed may be impracticable, therefore such deviations as the commanding officer of the hospital concerned may deem necessary, may be made so long as the safeguarding of the effects of patients is assured.

Responsibility for. The commanding officer of a hospital is responsible that due care is observed in safeguarding the money, valuables, clothing, and other effects of patients admitted to hospital. The registrar is ordinarily the custodian of money and valuables turned over to the hospital by patients for safekeeping.

Money and Valuables. Patients are informed by the admitting officer that the hospital will receive for safekeeping money and valuables, including watches, trinkets, personal papers, keepsakes, etc., and that receipts will be given for such articles by a commissioned officer. In case the patient is unconscious he is searched by the admitting officer in the presence of a witness, for money and valuables, which are receipted for by a commissioned officer and properly safeguarded. Money and valuables are received and receipted for without condition or other evasion of complete responsibility by the commanding officer, or by an officer designated by him. Money and valuables of considerable intrinsic value, such as watches and jewelry, are deposited in a bank or locked in the hospital safe. Articles of lesser value may be stored in locked compartments in a well safeguarded storeroom. Enlisted men are forbidden to receive money or other valuables from patients for safekeeping. When a patient is discharged, transferred, dies, or deserts, his money and other valuables are disposed of as prescribed for the disposition of effects other than public property. (See below).

Method of Accounting for Money and Valuables. The custodian (registrar) keeps a book of receipt blanks with stubs, receipts and stubs being numbered serially. He gives each patient a receipt listing the money and valuables received from him for safekeeping, and lists them on the corresponding stub which the patient signs, indicating that the list is correct and shows all his money and valuables at the time of deposit.

The custodian deposits all money in the hospital safe, or a local bank to the credit of "Patients' Fund." Money deposited in a bank draws no interest unless the patients to whom it belongs signify in writing their consent to the transfer of any accrued interest to the hospital fund. The custodian keeps a patients' fund cash account wherein is debited all money received from, and credited all money returned to, patients. This cash account is balanced at least once a month and when audited.

The custodian of patients' fund has a ledger, preferably loose leafed, in which he keeps an individual account of the money and valuables of each patient. The individual accounts are balanced at least once a month and when audited.

Any patient desiring to withdraw money or valuables is required to present his receipt. The custodian notes on the back of the receipt and on the stub the date and amount of the withdrawal, and requires the patient to initial or sign both. In case of withdrawal of all the patient's deposits, the custodian takes up the receipt and attaches it to the proper stub. Likewise, a patient on withdrawing money or valuables is required to initial the entries thereof on his individual account in the ledger.

The commanding officer of the hospital designates an officer other than the custodian to audit the patients' funds at the end of each month.

Public Property. If practicable, patients on being sent to hospital leave their arms and accouterments with their organizations. When brought to hospital public property is safeguarded as prescribed herein. If the patient's disability is so slight as to require treatment for a few days only the property is kept intact, tagged and stored, and returned to him upon his return to duty, his receipt being taken up; otherwise the property is, if practicable, turned over at once to his commanding officer, whose receipt should be obtained. If it is not practicable to transfer the property to the patient's commanding officer, action is taken as follows:

The officer at the hospital takes up on his return Medical Department property in the soldier's possession and forwards his receipt therefor to the accountable officer.

If the property officer is accountable for quartermaster or ordnance property, he takes up on his quartermaster or ordnance papers all property belonging to those departments brought in by the patient; otherwise he transfers such property to the nearest representative of those departments, whose receipts therefor are obtained.

The patient's commanding officer is immediately notified of the above action.

Personal Effects other than Money and Valuables. Upon admission of a patient to hospital his personal effects, other than money and valuables (see above), are listed in duplicate on patient's property card (Form 75, M. D.) in his presence (or in the presence of a witness in case the patient is unconscious or insane), signed by the patient (if conscious), bundled and tagged for identification (Form 76, M. D.) and properly and securely stored. The soiled clothing of patients is washed as a part of the hospital laundry, and disinfected when it is deemed necessary, before being stored. The original property card is filed with the hospital records and the duplicate held by the patient or kept at his bedside.

When a patient returns to duty, is furloughed, or is discharged from the service and leaves the hospital, the commanding officer restores his effects and takes his receipt therefor.

When a patient dies or deserts, his effects are disposed of as indicated in AR 615-300.

When a patient is to be transferred to another hospital his effects are, if he is able to take care of them, restored to and receipted for by him. When he is unable to take care of them, they are intrusted to the senior officer or enlisted man in whose charge the patient is being transferred. A list of the effects is furnished to such officer or enlisted man, who gives his receipt therefor to the transferring officer. On arrival at destination, the custodian of the effects while in transit turns them over, with the list, to the commanding officer (or his representative) of the receiving hospital and takes his receipt therefor.

Service Records of Enlisted Patients. *Upon admission or transfer of patients to a hospital.* Whenever an enlisted man is detached from his company or other organization or station for treatment or observation by and under control of officers of the Medical Department, his company or other immediate commander sends the man's service record directly to the commanding officer of the hospital or other place to which the patient is or has been sent. If the service record is not received by such medical officer in due time, he makes a direct call upon the proper officer to furnish it. The service record of the patient is transmitted by indorsement to the several officers under whose charge he comes in the course of subsequent transfers, should such ensue, from hospital to hospital by hospital ships, hospital trains, or otherwise, or when he is sent to an organization or station for duty.

Upon Disposition of Patient. Whenever an enlisted man, detached from his company or other organization or station for treatment or observation by and under control of the Medical Department, passes out of that control, his service record is forwarded at once by the responsible officer as follows:

In case of discharge, death, retirement, capture, desertion, return to duty, or upon receiving a furlough at the expiration of which the patient is to return to his company or other organization or station, or upon being dropped, to the man's company or other immediate commander;

In case of transfer to another company or other organization or station, to the immediate commander of the company or other organization or station to which the man is transferred;

In case of transfer to the Government Hospital for the Insane, to The Adjutant General. (See AR 600-500.)

Patients—Miscellaneous Provisions. *Transfers within the Hospital.* Patients are not transferred from one ward to another without the authority of the commanding officer of the hospital. The transfer of a case from one ward to another is reported to the registrar with the next morning report of the ward from which the case is transferred, giving name, rank, company, and regiment or corps, serial number, and ward from which and to which transferred. No special form is provided. A memorandum suffices, or a register card, Form 52, M. D. may be used.

Location Index. A suitable location index is maintained by the registrar of each hospital showing the name of each patient, the date of his admission, and the ward where he is being treated.

Ward Morning Report. To facilitate and assure the prompt and proper distribution of patients, each ward officer every morning immediately after his morning round of the ward, forwards to the registrar a morning report of the ward on Form 72, M. D., which is accompanied by diagnosis slips for new admissions, by all change of diagnosis cards, by the clinical records of all cases completed in the ward or which depart from the ward otherwise than by transfer to another ward, and by the notices of cases transferred to other wards since the preceding report. The ward morning reports, being of no permanent value, may be salvaged after they have served their purpose.

Hospital Clothing and Appliances. Hospital clothing is worn by patients only during their stay in hospital. Each article is marked as hospital property. When very sick patients are transferred from one hospital to another the hospital clothing necessary for their comfort may be sent with them, properly invoiced and accompanied by a check list, giving the names of the men in whose possession it is. Crutches and similar articles may, if necessary, be similarly transferred with the patient from one station or hospital to another. Upon the discharge from the hospital of a patient permanently disabled, he may retain the appliances then in his use which are necessary for his comfort and safety; the accountable officer dropping the same from his stock record, and submitting a certificate explaining the circumstances as a voucher for so doing, to which is appended the patient's receipt for the appliance.

Commutation of Rations. The ration of any of the following classes, while a patient in a hospital, dispensary, hospital station, hospital ship, army transport, hospital train, or convalescent camp, pertaining to the Army, is commuted at the rate indicated below—

Enlisted men in the active service of the United States (including enlisted men of the Philippine Scouts).

Enlisted men of the National Guard, National Guard Reserve, or Enlisted Reserve Corps admitted from training camps or service schools.

Discharged soldiers undergoing treatment.

Applicants for enlistment.

Civilian employees of the Army who are entitled to subsistence at public expense.

Prisoners.

Destitute persons admitted to hospital.

Rates. The ration of patients enumerated above is commuted as follows:

At establishments maintained for the treatment of tuberculous patients, at the actual cost of the ration plus 90 per cent; in all other cases at the actual cost of the ration plus 50 per cent.

The term ration as used above refers to the "Garrison ration" unless otherwise directed by proper authority in time of war.

In the case of members of a Reserve Officers' Training Corps unit admitted from a Citizen's Military Training Camp, while any one of these persons is a patient in a military hospital or other establishment, the ration of such patient is commuted at the same rate as the per diem ration allowance for trainees under instruction at such camps.

In the case of officers and warrant officers of the National Guard and the National Guard Reserve and of officers of the Officers' Reserve Corps, who may be entitled to subsistence at Government expense, while any one of them is a patient in a military hospital or other establishment the ration of such patient is commuted at the rate prescribed as the subsistence charge for officers of the Regular Army when under treatment in the same establishment. Such disbursements are authorized under the provisions of act of March 4, 1923.

Vouchers. Vouchers covering the commutation referred to above are prepared by the custodian of the hospital fund of the Medical Department unit concerned.

Subsistence and Other Charges for Patients. *Subsistence Charges.* The following is the schedule of rates for subsistence charges for patients in Medical Department establishments (except the Army and Navy and the Fitzsimons General Hospitals), who are not entitled to commutation of rations. Rates for patients in the Army and Navy and the Fitzsimons General Hospitals are found in AR 40–605 and 40–610.

For officers, and warrant officers, $1 a day, except in hospital stations, where the rate is an amount equal to the commutation rate prescribed, plus 10 cents a day.

For officers and warrant officers of the Navy and Marine Corps and for civilians on the status of officers, $1.25 a day, except in hospital stations, where the rate is the same as for officers of the Army.

For members of the Army Nurse Corps, whether on duty or as patients, at the prescribed commutation rate, but not to exceed 60 cents per day.

For retired enlisted men of the Army, Navy, and Marine Corps and for civilians on the status of enlisted men, an amount equal to the commutation rate, plus 10 cents a day.

Medicine Charges. Medicine (including dressings) charges are made for patients in Medical Department establishments who are not entitled to medical care and treatment at the expense of Army appropriations, including officers and enlisted men of the Navy and Marine Corps, civilian employees and civilians.

The rate for medicine (including dressings) charges for patients in Medical Department establishments is 25 cents per day, unless the actual cost of the medicines (including dressings) exceeds that amount, in which event the rate will be actual cost of the medicines (including dressings).

Miscellaneous Charges. For certain classes of patients, such as beneficiaries of the United States Veterans' Bureau, charges for service other than subsistence and medicine are made.

Hospital Matrons. Hospital matrons are allowed at hospitals and stations in numbers fixed by The Surgeon General. Matrons are appointed by the commanding officer of the hospital with the approval of the station commander. The compensation of a hospital matron is $10 per month and a ration in kind or by commutation. No extra compensation is allowed for the performance of duties incident to her employment, nor are other persons to be employed at the expense of the United States to do her work or any part of it. Matrons are not entitled to leave of absence, or to pay and rations while absent or while unable to perform their duty. Matrons are forbidden to sublet their work to other persons.

Duties. It is the duty of the hospital matron to mend and keep in repair the table, hand, and operating room linen, the bedding and hospital clothing belonging to the Medical Department, including the linen of the dental clinic, and to do the hospital laundry, or so much thereof as possible up to a minimum of 500 pieces a month, from time to time, as the same may be required by the commanding officer of the hospital. In case of matrons on duty at the larger stations, The Surgeon General may modify or waive so much of the provision as requires laundering 500 pieces of hospital linen a month in addition to all the mending.

Laundry. The hospital laundry consists of—

The linen, clothing, and bedding belonging to the Medical Department.

The washable clothing of patients under treatment in the hospital.

The white coats and trousers of enlisted attendants.

The uniforms of members of the Army Nurse Corps.

Washable clothing of civilian attendants when their contracts of employment entitle them to this service.

At hospitals where hospital matrons are employed the laundry is done by the matron as above described. The excess laundry at hospitals where there are matrons and the entire laundry at other hospitals (except those with laundries or otherwise provided for under special instructions from the Surgeon General) is put out to private laundries or individual laundrymen or laundresses. See AR. 40–590.

Ice. *As Food or for the Preservation of Food.* The chief use of ice in hospitals is as an article of food or for the preservation of food. For such use it is obtained from the Quartermaster Corps, or by purchase from the hospital fund.

For Therapeutic or Special Medical Department Purposes. Ice required for medical administration proper, such as for ice baths for the sick, for medical photographic work, etc., is procured from the Quartermaster Corps, or else obtained by purchase at the cost of the medical and hospital appropriation. Routine purchases of ice for medical purposes are not made without the previous authority of the Surgeon General, or, outside the continental limits of the United States, of the surgeon of the department or the chief surgeon of the expeditionary force concerned. Accounts for emergency purchases are invariably accompanied by a separate statement of their necessity. Accounts for ice for medical work are stated on W. D. Form No. 330 or W. D. Form No. 330a, show the officer's certificate (taking care not to encroach on the back of the form) specifically what the ice was for, as for use in the treatment of sick in hospital, and are forwarded, with one invoice of articles purchased, Form 12, M. D., to the corps area or department surgeon, or if from a command under the immediate supervision of the War Department, to The Surgeon General, unless otherwise directed by him.

Mess Management. The provisions of regulations relating to company messes are applied, as far as they are adaptable, to hospital messes.

The food supplies for the patients and enlisted hospital personnel consist of rations issued by the Quartermaster Corps, of articles purchased with or derived from the hospital fund, and of products of the hospital garden.

When, under the conditions usually prevailing at any station or with any command, the commutation of the rations of the patients in hospital is not sufficient for the purchase of suitable food, the commanding officer of the hospital makes application through military channels to the Adjutant General for the issue of rations in kind.

For methods of preparing food for patients and personnel, reference should be had to standard handbooks on the subject, and particularly to the Manual for Army Cooks.

When the number of patients requiring special diet is large, the commanding officer of the hospital establishes one or more diet kitchens for the preparation of their food, under the immediate direction of such skilled dietitians as are available. Competent dietitians belonging to the Army Nurse Corps may be assigned to this duty. Rules for the management of diet kitchens are prescribed by the commanding officer of the hospital, according to the particular needs of each case.

Supervision by the Commanding Officer. The commanding officer of the hospital constantly supervises the messes and exercises every precaution to prevent waste and misuse. He uses the utmost care when assigning personnel to mess management, to assign only those of known probity and good habits. He requires all bills to be settled promptly at the end of every month. At large hospitals he may place the messes under the direct supervision of a junior officer; but in all cases by frequent inspections sees that waste or wrongful diversion of supplies or funds is not permitted, and that the messes are so managed that neither patients nor personnel will have just grounds of complaint over the quality or quantity of their food.

Bills of Fare and Diet Cards. Bills of fare for diets prescribed by or under the supervision of the commanding officer are made out and posted in the wards and kitchens. Additional articles not included in these diets are ordered for special cases only.

Each ward officer daily, immediately after he has made his first visit to his ward, fills out a diet card, Form 73, M. D., covering the diet requirements of the ward patients for the ensuing 24 hours. The diet cards from the wards are sent promptly to the mess office, where the necessary card or cards are made out covering the meals of the hospital personnel. All the cards are thereupon turned over to the noncommissioned officer in charge of the mess in sufficient time for the preparation of the day's meals. Additional cards for newly admitted patients or newly arrived personnel are made out promptly when necessary and sent to the noncommissioned officer in charge of the mess without delay. The diet cards are salvaged after they have served their purpose.

Noncommissioned Officer in Immediate Charge. Each hospital mess is placed under the immediate charge of a competent noncommissioned officer. It is his duty to receive and care for all articles of food for the mess, and he is held responsible for their proper use. He should be provided with suitable means for preserving perishable foods, and a suitable storeroom guarded by locks and keys. He issues daily from the stores to the kitchen the articles according to diet cards and sees that food is cooked as indicated thereon. He keeps such record of his receipts and issues of articles of food as the commanding officer of the hospital may direct. He is responsible for the orderliness and cleanliness of the mess room, kitchen, and storeroom, and for the cleanliness of cooking utensils and linen used in preparing, preserving, and serving food. He is responsible for the proper and timely serving of food both in the mess room and in the wards. Utensils and table linen used for patients with communicable diseases are disinfected promptly after being used and before their return to the storerooms. A sufficient number of assistants are provided to assure efficient performance of these duties.

A mess account on Form 74, M. D., is kept by the noncommissioned officer in charge. It should be filed at the end of every month with the retained hospital fund papers for that month. Abnormal gains or continual losses are carefully investigated. The commanding officer of the hospital inspects this record at frequent intervals, so as to keep constantly informed on the status of the mess account. When there is more than one mess, a consolidated mess account on the same form for the entire hospital is kept in the executive office, the noncommissioned officers in charge of the several messes being required to report daily the data therefor.

Pharmacy Management. The commanding officer of the hospital is responsible for the proper operation of the pharmacy. He exercises careful supervision over it, either directly or through a subordinate Medical Department officer detailed by him to assume immediate charge.

Potent poisons, alcohol, alcoholic liquors, and all habit-forming drugs must be kept under lock and key in a separate closet. The officer in charge of the pharmacy is responsible for safeguarding the use of the key.

Within the meaning of regulations, a potent poison is any substance (drug, chemical, or reagent) which is likely to destroy human life or seriously endanger health when applied externally to the body or when taken internally in a dose of less than one teaspoonful—4 c. c., or, in the solid state, 4 gm.

Records. In time of peace and so far as practicable in time of war, all prescriptions are written in the metric system. They are placed on file in three separate files, as follows:

Prescriptions for alcohol or alcoholic liquors, and for medicines containing opium or any of the salts, derivatives, or preparations of opium or coca leaves.

Prescriptions for civilians which do not include articles of the preceding class.

All other prescriptions.

Prescription files are subject to inspection by inspectors and station commanders at all times. In connection with the file for alcohol, opium, etc., a record is kept of the pharmacy receipts and expenditures of each article. Unless otherwise authorized by the Surgeon General, this record is made on Form 17a, M. D., adapted as may be necessary for the purpose. A separate slip is kept for each form in which the liquor or drug is supplied, as "Morphinae sulphas, powder," or "Morphinae sulphas, 10-mgm. hypo. tablets." The date of receipt thereof from the storeroom is noted in the left-hand column and the amount, in the proper metric unit, in the debit column. The expenditures are noted by entering the prescription number in the left-hand column and the amount expended in compounding the prescription in the credit column. At least once a month the slips are balanced and the quantities remaining on hand verified by a Medical Department officer, and the facts, with date of balance, noted over his signature.

Charges for Medicines, Etc. Civilian Employees of the Army stationed at military posts may purchase medical supplies when prescribed by a medicar officer. Medicine charges for employees not in hospital are as follows: In ordinary cases, 25 cents for each prescription; in the case of expensive medicines, dressings, appliances, etc., at such increased rate, to be determined by the commanding officer of the hospital, as will reimburse the United States for their cost.

Medicine charges for civilians in hospital are fixed at 25 cents a day.

Hospital Fund. (See AR 210-50.) The hospital fund is maintained in every hospital for the purpose of messing the hospital personnel and patients and providing authorized and legitimate recreation and entertainment.

The sources from which the hospital fund are derived are: Ration allowances of patients and enlisted men on duty; dividends from the Post Exchange; sales from the garden; money received for the subsistence of officers and civilians treated in hospital; the sale of property purchased with the hospital fund or products pertaining to the hospital fund; nurses subsisted in a mess conducted by the commanding officer.

The hospital fund is kept by the commanding officer or by an officer detailed by him for this duty, who is held responsible for the loss of any portion of the fund not deposited in a bank or the hospital safe. Expenditures therefrom are limited to the purchase of food or other articles for the benefit of patients and enlisted men on duty in the hospital. Savings on food supplies (rations) may be spent only for the purchase of food for the messes.

A statement of the hospital fund is prepared monthly and audited by the hospital council, the proceedings of which are recorded on the retained statement of the hospital fund. Articles such as musical instruments and athletic appliances, purchased with the hospital fund, are known as "durable property", and remain the property of the hospital fund, being accounted for on the return. All hospital fund statements are finally viséd and filed in the Surgeon General's Office.

Deaths and Preparation of Remains. Whenever the death of a person occurs at any Army hospital, the commanding officer of the hospital makes official reports in writing as indicated below. If the commanding officer of the hospital is also a post or station commander he, in addition to the reports required below, renders reports required by regulations of a post or station commander in case of a death in the command.

Reports. To the station commander, stating name of the deceased, his rank and organization, if a person in the military service or definite status if a civilian employee or other civilian, the date, time, place, and cause of death, and in case of an officer, warrant officer, cadet, flying cadet, enlisted man or member of the Army Nurse Corps, whether or not death occurred in line of duty, and whether death was or was not the result of the individual's own misconduct.

To the corps area, department or expeditionary force surgeon in case of death of a Medical Department officer, a member of the Army Nurse Corps, or a Medical Department enlisted man above the grade of sergeant, giving date, time, place, and cause of death.

To the Surgeon General, a duplicate of the report referred to in the preceding paragraph, in case the death has occurred within the continental limits of the United States.

Such other reports as may be required by regulations or other proper authority.

Preparation of Remains. The commanding officer of the hospital is responsible for the preparation of the remains for burial, including verification of the employment by the undertaker of effective and scientific embalming processes where embalming is required, including vessel injection, and ligation after autopsy. His responsibility does not end, if the deceased was a member of the Military Establishment, until the remains have been removed from the hospital or undertaker's establishment by the quartermaster for shipment or burial. The commanding officer of the hospital or his commissioned representative inspects each body immediately after death, and again after it is properly clothed and ready to be placed in the casket, and files in the hospital a signed record of the fact of compliance with the above requirements.

Undertaker. Whenever the services of an undertaker or embalmer are necessary the commanding officer of the hospital promptly notifies the undertaker under Government contract, or if there be no such undertaker, he notifies the local quartermaster who employs an undertaker. No undertaker is to be employed who is not considered competent by the medical officer responsible for the preparation of the remains.

Autopsies. An autopsy can be performed upon the body of any person dying in the military service when the commanding officer of the hospital or the surgeon of a station or command deems such procedure necessary in order to determine the true cause of death, and to secure information for the completion of military records.

Complete autopsy records of all autopsies performed are kept. A copy of the records of each case is forwarded directly to the Curator, Army Medical Museum. (See AR 40-10.)

Hospital Safe. Knowledge of the combination of the lock of the hospital safe is guarded with the utmost care by the commanding officer of the hospital. Any change in the combination is immediately reported by confidential letter directly to The Surgeon General, or, if outside the continental limits of the United States, directly to the surgeon of the department or expeditionary force concerned, identifying the safe by its make and number.

Hospital Rules. The commanding officer of a hospital is responsible for the formulation and enforcement of such hospital rules as are necessary for the guidance of patients and duty personnel. Rules are kept posted in appropriate places so as to be easily seen and read by those persons to whom they are applicable. The rules below have in the past been instrumental in promoting the administrative efficiency of hospitals, and serve as a good guide in drawing up detailed rules for a hospital.

General Rules. Each officer in charge of public property will keep an accurate account of the same and of its place of distribution.

Each person in charge of a department of the hospital is responsible for the public property in his department. The responsible person will keep a list of the same, and will by frequent inventories (at least once a month) assure himself of its presence.

All public property in the possession of the men must be kept in good order, and missing or damaged articles accounted for.

A person will upon his assignment to a department of the hospital make himself familiar with the special orders and rules governing it, and all must familiarize themselves with the standing orders of the hospital.

All noncommissioned officers and privates of the detachment will be present at all formations unless specially excused.

All men on duty in the kitchen and mess room will arise at least one hour before reveille; all other members of the detachment, unless specially excused, will arise at or before first call for reveille.

Immediately after reveille each man will arrange his bed and personal belongings in a neat and orderly manner. All clean under-clothing will be uniformly packed in his locker; other clothing will be brushed and hung in the lockers or in a designated place. Soiled clothing will be kept in the barrack bags. Shoes will be polished and neatly arranged in the lockers or under the sides of the beds.

All beds will be overhauled and cleaned each week and, weather permitting, the bedding and mattresses will be well shaken and hung out to air for at least two hours each week. Mattress covers will be changed immediately before each monthly inspection, and oftener if necessary. Sheets and pillowcases will be changed at least once each week.

A card bearing the name of the soldier will be attached to the foot of his bed, and his accouterments will be hung, neatly and uniformly arranged, on the foot end iron of his bunk.

The squad room will always be kept clean, neat, and orderly.

The men will pay the utmost attention to personal cleanliness; each man will bathe at least once weekly, his hair must be kept short, face shaved, beard neatly trimmed, and underclothing frequently changed.

Members of the detachment will wear the prescribed uniform at all times when present at the station. While on fatigue they may wear the fatigue clothing. While on duty in wards, pharmacy, operating room, mess room, or kitchen, they will wear the white uniform.

No member of the detachment will leave the hospital bounds except by permission of proper authority or, in case of emergency, in the execution of duty.

Immediately after breakfast the hospital will be thoroughly policed in every department. It must be ready for inspection at the hour designated by the commanding officer, and always kept scrupulously clean.

No member of the hospital personnel will borrow from or have financial dealings with any patient.

A noncommissioned officer in charge of quarters will be detailed daily by roster from noncommissioned officers on duty with the detachment, and an emergency squad will always be designated.

The noncommissioned officer in charge of quarters will make an inspection of all wards and quarters at such times as the commanding officer of the hospital may direct, will report all unauthorized absentees to the noncommissioned officer in charge of the detachment, and will see that no unauthorized lights are burning. In case of fire he will give the alarm and proceed as ordered in fire regulations. He will be responsible for the efficient performance of duty by the guards.

The guard will be under the immediate orders of the noncommissioned officer in charge of quarters. He will patrol the hospital grounds at least once every three hours and will be constantly on the alert for fire, unauthorized lights, and unauthorized persons in or about the hospital. The guard will at once report to the noncommissioned officer in charge of quarters all unusual occurrences and violations of existing orders which come under his observation.

Ward Rules. The head nurse, or in wards in which members of the Army Nurse Corps are not assigned, the ward master of each ward, is directly responsible to the ward officer, and will be in charge of the ward and the enlisted assistants and patients in it, and will be obeyed and respected accordingly.

The head nurse or, in wards in which members of the Army Nurse Corps are not assigned, the ward master is responsible for the cleanliness and order of the ward, for the public property therein, and for the effects of the patients until they have been turned over to the proper custodian, and is responsible for the prompt delivery of prescriptions to the pharmacy, of medicines to the ward, and of the diet cards to the mess office.

In wards to which members of the Army Nurse Corps are not assigned the ward master is responsible for the administration of medicines and other treatment prescribed, the keeping of records, and all other duties that may be assigned to him by the ward officer. No enlisted men, except those authorized in writing by the responsible medical officer to do so, will administer medicine to a patient in hospital, and then only as directed by the responsible medical officer and under such limitations as his written authorization shall prescribe.

Phenol, bichloride of mercury, other active poisons, alcohol and alcoholic liquors, when necessarily on hand in the ward, will be kept under lock and key and every precaution taken to prevent their improper use. Disinfectants such as formalin, cresol, etc., and medicines for external use only, will not be kept on the same shelf or in the same medicine cabinet as medicines for internal administration.

On the death of a patient the ward master will notify the ward officer, or in his absence the medical officer of the day. He will not remove the body from the ward until after it has been examined by a medical officer.

The ward master will see that patients are acquainted with ward rules.

Before leaving the ward at the end of his daily tour of duty, the ward master will turn over to his relief all orders of the ward officer, accompanied by such explanation and instructions as may be necessary.

Upon reaching the ward patients will be promptly bathed, clothed in clean hospital clothing, and put to bed, unless their condition indicates otherwise or a specific order forbids.

Money and valuables found on patients will be disposed of in the prescribed manner. The commanding officer will not be responsible for money or valuables of patients not turned over for deposit in the hospital safe.

A clinical record will be carefully kept for each patient. Upon final disposition of the case this record will be completed and signed by the ward officer and turned in to the record office.

No information regarding the diseases or condition of patients under treatment will be given to anyone except those authorized under the regulations to receive it.

Visitors will be allowed to see friends in the ward at a specified time, when their presence will in no way disturb other patients.

Bed linen will be changed on occupied beds at least twice weekly, and oftener if necessary to insure cleanliness. Whenever a bed is to be occupied by a new patient clean linen will be furnished. All bedding and clothing used by infectious cases will be promptly disinfected when removed from the beds. Patients will not occupy their beds when dressed in other than hospital clothing.

Loud noises, boisterous actions, the use of profane language, and gambling are forbidden in the wards, and no food, intoxicants, or other articles of food or drink, except as prescribed or authorized, will be brought into the wards.

Patients are forbidden to use towels, basins, toilet articles, eating utensils, or articles of clothing, pertaining to another patient.

CHAPTER XVII

NURSING

Introduction. The fact that members of the Army Nurse Corps are on duty at all of the larger hospitals of the Army does not relieve medical soldiers of the responsibility of acquiring a practical knowledge of the principles of nursing. Even where graduate nurses are assigned, enlisted men work side by side with them in ministering to the sick and wounded.

Members of the Army Nurse Corps are not assigned to many of the smaller hospitals, nor to hospital stations in the field. All of the nursing required in those establishments and formations must be rendered solely by enlisted men. The conditions most essential to the recovery of the sick are rest, absolute cleanliness, an abundance of fresh air, and the timely administration of the treatment prescribed by the medical officer. These the nurse should always seek to assure. Not all medical soldiers are fit to become nurses. They must, however, receive training in this subject in order to show whether or not they possess aptitude along those lines. Study and experience are both necessary, and the two must go together.

The Ward. The wards of all hospitals are arranged on the same general plan.

The number of beds in each ward varies from twelve to fifty, and usually there is connected with each a toilet-room with baths, basins and water-closets, a nurse's or wardmaster's room, and a "quiet room" for special or seriously ill patients. Near the ward is a room or cabinet for patients' effects, and a linen closet sufficient to contain enough linen for current ward use.

In our peacetime hospitals the beds are arranged in pairs between adjacent windows, with a space of three feet between the beds and three and a half feet between each pair of beds. About 100 feet of floor space and 1,200 cubic feet of air space are allowed to each bed; in the tropics this should be increased to about 150 square feet of floor space and 3,000 cubic feet of air space; in wards for infectious diseases the floor space should be at least the same as that allowed for the tropics.

Between each pair of beds is a chair, and adjoining each bed a bedside table; this with a folding bed-screen constitutes the official furniture of the ward, which is purposely made as free as possible from appliances which are not only useless but collecting places for dirt and disease germs. Usually, however, there is a table for the wardmaster or nurse, and another with a small cabinet to contain ward medicines. In our field units many of these refinements are lacking. As they usually are but temporary installations all equipment must be reduced to absolute necessities.

Ventilation. The hospital ward is heated by hot water or steam and ventilated by special openings for entrance and exit of air. These air shafts are calculated to introduce three thousand six hundred cubic feet of fresh air per hour per patient. The entering air is warmed by passing over hot-water coils beneath the floor, while foul air escapes through shafts artificially heated by hot-water pipes so as to produce an up draught.

When no special arrangements are made for *ventilation* the natural openings of the ward, such as doors and windows, are used for the purpose. The object must be to introduce as much fresh air as possible without reducing the temperature of the ward below the normal standard of 68° to 70° F., and without causing unpleasant draughts.

One of the simplest plans to secure *ventilation* when this is not specially provided for is to place a board under the raised lower sash, the air passing in between the sashes (Fig. 121), or to pull down the upper sash and protect the opening by a sloping board (Fig. 122). In either case the cold entering air is directed upward. Occasionally it is necessary to flush out the ward by opening wide the doors and windows for a few minutes; in such cases the patients should be thoroughly wrapped up, as if out of doors.

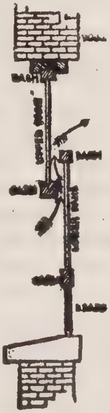


Fig. 121.—Window Ventilation; board below lower sash.

Duties of Personnel. Each ward is under the care of a nurse or wardmaster, who is responsible for the comfort, diet and medication of the patients, the performance of their duty by the attendants, the preservation of the ward property, the regulation of the heat, lights, and ventilation, and the cleanliness of the bed linen and clothing, lavatories, baths, water closets, etc. One nurse is sufficient for a ward of twenty beds when the cases are not of an acute character, but two may be required under special conditions.

The nurse or wardmaster accompanies the medical officer on his rounds, takes down his directions in the ward book, and sees that they are carried out. Each nurse, or wardmaster, has specified duties assigned so that each may know exactly what is expected of them. Cultivating the habits of observation, neatness, and system is essential. In passing about the ward they should observe the condition of the patients, the beds, chairs, tables, etc., and should at once correct anything that is out of order. There should be a place for everything

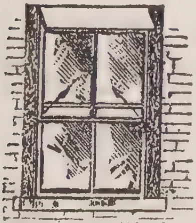


Fig. 122.—Window Ventilation; board above sash.

and everything in its place. When anything has been used it should at once be cleaned and put back where it belongs, so that when occasion for its use comes again no time may be lost in looking for it and cleaning it.

When a medical officer unattended by a noncommissioned officer enters the ward the wardmaster should at once arise and call *attention* and at the same time approach the medical officer to render any assistance he may require; the same courtesy must be rendered the commanding officer or, in fact, any other officer.

When strangers enter the ward the nurse or wardmaster should ascertain their business and show them proper courtesies; they should not be allowed to wander through the ward by themselves.

A nurse or wardmaster should never leave their ward without informing the next senior nurse where they are going and for how long, and placing the latter formally in charge.

The tour of a *night nurse's* duty usually extends from immediately after supper until after breakfast the following morning. The day nurses serve the supper to the patients and the night nurses the breakfast; each completes their own work and cleans up everything that has been used during their tour of service. The night nurse renders a written report of all that has happened during the night and turns over to the day nurse any instructions still to be carried out.

In each ward a book or other suitable record should be kept containing a complete inventory of all the ward furniture, bedding, and appliances; when any of these articles become soiled, worn out, or broken they are exchanged for clean or new ones, but the number of each should as far as possible be maintained unchanged.

When relieved in a ward the nurse or wardmaster should turn over the articles to their successor and take a receipt in the book.

Cleaning. Going on duty in the morning the nurse or wardmaster must begin at once to get things in order for the morning rounds, usually at nine o'clock. All the ward attendants must report promptly and assist in this work. Chairs should be put in their places, bedside tables cleared of superfluous articles, and beds made up. Bed patients should have their hands, faces, and teeth washed, and hair brushed. Convalescents who are able to do so may be required to assist in the ward work.

The floors should be *dusted* with a floor brush covered with a cloth wrung out of five per cent phenol or one per cent cresol solution and quickly polished with the polishing brush, and if of tile scrubbed with soap and water as often as necessary, and the chairs, tables, beds, and window-sills freed from dust by a cloth dampened in the same solution.

Hospital floors should be made as impervious as possible, so that they may not absorb germs and dirt. They ordinarily have a hard finish and are kept smooth and polished by using on them a solution of paraffin or paraffin and wax in turpentine, and frequent polishing with a weighted polishing brush covered with a piece of blanket. A commonly used preparation consists of six ounces of paraffin dissolved in a gallon of turpentine, with the addition of an ounce of soft soap, just before using; this is applied with a mop, and when dry is rubbed in with the floor polisher.

A floor so finished should not be scrubbed with water; spots may be removed with turpentine.

After the ward is made ready the lavatory should be attended to; all urinals, bed pans, and bottles should be thoroughly cleaned, shelves wiped off, closet-bowls and seats washed, and bath tubs scrubbed.

To clean brass, copper and nickel, a mixture of oxalic acid, alcohol and kerosene is very effective; for enameled ware use soap and hot water, removing stains with chlorinated lime.

For porcelain utensils never use sapolio, oxalic acid or strong alkalies; they destroy the enamel; warm water and soap, followed by kerosene, are best.

In addition to this daily cleaning a more thorough preparation is made for Saturday inspection. The walls, window borders, and all projections and corners, should be brushed with a long-handled soft brush covered with a damp cloth. Windows and sills, tables, chairs, and unoccupied beds are washed, and cots and mattresses gone over for bed-bugs. For the eradication of bedbugs see Chapter XIII.

Whenever a bed is vacated mattress and bedding should be thoroughly aired and sunned, and disinfected if necessary. The same bed linen should never be used, without washing, for two consecutive patients.

In addition to the daily and weekly cleaning there should be a thorough disinfection of the wards twice a year, or whenever infected.

To prevent the pollution of the ward air, all discharges, such as urine, feces, sputum, and vomited matter, soiled dressings and linen, and dirty vessels should be promptly removed. The vessel containing discharges should be covered at once, using a piece of rubber sheeting or a towel if the vessel has no cover, and should never be carried through the ward uncovered.

Soiled dressings should be received in a covered pail, or paper bag, and promptly burned.

Sputum cups, if the metal type is being used, should be frequently disinfected by boiling, and bed pans and urinals scalded with hot water after each use, and always kept clean.

Ward Management. A patient may be able to walk to the hospital, or he may be brought there in an ambulance or on a litter. In either case he should be examined at once by the senior noncommissioned officer present; if he has been seen already by a medical officer, directions for his disposition should accompany him; if he has not been seen by a medical officer one should be notified promptly. Pending his arrival the noncommissioned officer should take the necessary steps, taking care that no contagious case goes into the general wards. Generally there is a standing rule in hospitals that all patients should be given a bath before being put to bed, unless there are orders to the contrary or the patient's condition is such as to render a bath undesirable. After the bath the patient is given a suit of hospital clothing and put to bed. An inventory of his clothing, valuables, etc., is made as described in Chapter XVI. The clothing is then inspected and if it requires disinfection is at once sent to the disinfecting chamber; otherwise the underclothing should go to the laundry and the remainder, tied securely in a bundle, to the property room. Meantime it is well to offer the patient a glass of water or milk to make him feel that he is being cared for. After the patient is comfortably in bed, his pulse, temperature, and respiration are taken and recorded; the first urine passed is saved in a clean vessel, for examination.

Bed patients should wear hospital clothing only; but, on the other hand, patients allowed up should not be permitted to wear hospital gowns or pajamas under their own clothes; unless this point is looked to, hospital clothing will often be missing.

Food and medicines must be administered promptly and in a proper way.

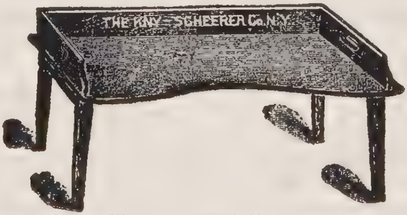

THE KNY—SCHEERER Co. N.Y.

Fig. 123.—Bed Tray.

The nurses' hands must be kept clean and free from odors. Nothing is more disgusting to one who is already ill than to have food presented with dirty hands. Finger nails should be kept short and clean.

Serving Food. One of the most important duties about the hospital and perhaps the one most frequently neglected is the *serving of diets.* The nurse or wardmaster should be in the ward at meal times to see personally that the diets are promptly and properly served. Utensils should be clean, plates warmed, and no slopping-over allowed. Food which is intended to be hot should reach the patient in that condition. Used utensils and unconsumed food should be promptly removed from the ward and all crumbs and débris cleaned up.

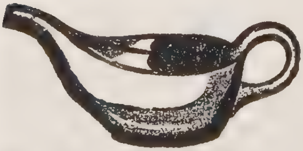


Fig. 124.—Feeding Cup.

Patients able to sit up in bed use the bed tray (Fig. 123), those unable to sit up must be fed by one of the ward attendants. To administer liquids the head and shoulders are raised and a feeding cup (Fig. 124) or an ordinary cup or tumbler is used. When the head should not be raised the liquid may be taken through a bent glass tube. When the sick man is unconscious, liquids must be given very slowly, taking care to avoid choking.

Utensils used for patients with infectious diseases must be kept separate from others and separately washed. Especially is this important in the case of syphilitics with mucous patches in the mouth, and in typhoid fever cases.

Very ill patients on liquid diet should have their nourishment regularly at night, as well as by day, unless there are special orders that the patient shall not be awakened. Very often wakefulness is due to insufficient nourishment, and a glass of milk or a cup of beef tea will often secure several additional hours of sleep.

Liquid diet includes only liquids, the most useful of which are milk, meat extracts, broths, gruels, albumen solutions, and, last, but not least, water.

Milk by reason of containing a proper proportion of all the important food principles is by far the most valuable single article of liquid diet. It may be given in many forms: Plain, peptonized, as buttermilk, whey, or junket; a patient on milk diet alone should take from two to five pints in the twenty-four hours.

Meat extracts have little value except as stimulants; it should never be forgotten that a patient fed exclusively on them would promptly starve; the same remark applies, in a less degree, to broths and gruels. Albumen water is valuable when milk is not tolerated. In all diseases, but especially in fevers, water in large quantities is indispensable; it flushes out the excretory organs, removing poisonous substances, aids the circulation, and lowers temperature in its evaporation from the skin. In all fever cases the amount of water given should be noted on the clinical record.

Administering Medicines. *Medicines* must never be left with a patient to be taken by him; the nurse should give them and see that they are swallowed before leaving the bedside. In giving medicines great care must be exercised to avoid mistakes. The label indicating the nature of the medicine and the dose must be carefully read, the bottle shaken, and dose measured out by pouring from the side of the bottle opposite the label so as not to spoil the latter. After the dose is taken the fact should be recorded, never before. A graduated medicine glass should always be used to measure doses, instead of spoons, which vary so much in size. Medicines ordered to be taken before meals should be given about twenty minutes before, while those to be taken after meals should usually be given immediately after. Sour medicine should not be given within a half-hour of the time when milk is administered. Sleeping patients should not be aroused to take medicine unless the medical officer has specially so ordered.

Pills are administered by putting them far back on the patient's tongue and giving him a swallow of water.

A *powder,* if small, should be placed on the back of the tongue and washed down with water or placed on a spoon and moistened with water; if large and bulky it should be stirred up with water in a tumbler and swallowed quickly before it settles.

The *ward medicine closet* must be kept locked and the nurse or wardmaster must take care to avoid an accumulation of medicines. When a patient for whom a mixture has been especially ordered leaves the ward his medicine bottle should be at once turned in to the pharmacy, and the same rule applies to all medicines not in current use.

Hypodermic Medication. To give medicines subcutaneously, the *hypodermic syringe* is used. Certain rules are necessary to prevent accidents with this instrument. The solution used must be freshly prepared; the needles must be clean, sharp, and aseptic; the syringe freshly sterilized; the skin where the injection is made must be cleansed.

To render the needle aseptic boil it a moment in a spoonful of water. Disinfect the syringe by boiling, or by emersion in 70% alcohol. Never attempt to use a needle the point of which is dulled or bent. In making the injection care must be taken to avoid blood-vessels, nerves, and bones; for this reason a fleshy part should always be selected and the injection made obliquely; the outside of the forearm or the front of the thigh is usually chosen.

Draw the medicine into the syringe, screw on the needle with sterile forceps, hold the syringe vertically, needle up, and gradually press the piston until all air has been forced out as indicated by the escape of a drop of fluid; wash the skin at the point of injection with a little alcohol, a daub of iodine, or plain soap and water, draw the skin tight, and thrust in the needle quickly. When the needle has penetrated about half an inch, force out the liquid slowly, withdraw the needle, and press a clean gauze sponge for a moment on the puncture. Before putting the syringe away cleanse and dry it thoroughly; remove the needle, force out the last drop of fluid, and at once insert the wire.

The *bed pan* should be warmed before use. This can be done by dipping it in hot water or placing hot water in it for a few minutes. As soon as removed from the patient it should be promptly covered, taken from the ward, emptied and washed.

Rubber sheets should never be folded, as to do so will crack them; when not in use, hang by the edges or roll on a wooden roller.

The patient's nails should be kept clean and special attention should be paid to his mouth and teeth. The teeth and mouth of helpless patients should be washed with a gauze sponge dipped in any mild antiseptic solution acceptable to the ward officer.

Deaths. *Dying patients* should preferably be removed to a separate room, but if this is not practicable their beds should be surrounded by screens so that the other patients may not be unfavorably affected by the sight. A medical officer should always be notified. As soon as death occurs the body should be removed, with as little disturbance as possible, and given proper attention.

The *signs of death* are cessation of respiration and of the heart's action, dilatation of the pupils with flaccidity of the cornea, and later coldness of the body, rigor mortis, and decomposition.

When respiration can no longer be seen its complete cessation may be verified by holding a mirror over the mouth; if there is any breathing at all the mirror will be clouded with moisture from the breath. When the heart and pulse can no longer be felt, tying a string around the finger will show whether the circulation has ceased; if it has not there will be some congestion of the end of the finger, while there will be no change if death has occurred.

In hospitals the sign of death most relied upon is the sudden and permanent dilatation of the pupils, with flaccidity of the cornea; the latter sign is elicited by touching the cornea with the finger, when, instead of being firm and resilient, it will be found soft and flaccid.

As soon as the body is removed from the ward the rectum, mouth and nostrils must be packed with cotton to avoid post-mortem discharges, a bandage with an absorbent cotton pad applied to the perineum, and the limbs straightened out and placed in position before *rigor mortis* or stiffening sets in. A little cotton should be placed under the upper lids, which are then closed. To prevent the jaw from dropping, a four-tailed bandage is applied to the chin, or a rolled-up bandage is fixed between the chin and sternum. The body is then wrapped in a clean sheet and, in hot weather, placed in an artificially cooled room.

Should an *autopsy* be necessary preparations are made for it. The body is placed on a table in the morgue; the post-mortem case is procured and the instruments laid out; the other arrangements necessary are at least three pails, one containing water, another to receive discharges, and the third for specimens which it may be desired to keep; a large bath sponge, two pairs of rubber gloves, basin with water, towels, strong thread and needles.

(In connection with the above read "Ward Rules" in Chapter XVI.)

Beds and Bed-Making. The regulation hospital bed is of white enameled iron with wire springs, and is excellent in every way. The mattress is of hair. Some of them come in three sections fastened together by straps, so that the soiling or destruction of one section does not necessitate the loss of the entire mattress; further to protect the mattress each is supplied with a removable cover which should always be used.

The bed covering should be warm but light; counterpanes being heavy and not porous are objectionable, and for occupied beds should be replaced by sheets.

To prepare a hospital bed first see that springs are in good condition and not sagging; then select a good mattress free from hollows, cover it with a mattress cover, and place it on the springs. Over the mattress spread a sheet, tucking it in first at the head and foot and then at the sides.

If the patient is liable to soil the bed a *draw sheet* comes next, otherwise it is omitted. The draw sheet consists of a rubber sheet about three by four feet, covered by a folded cotton sheet and spread across the bed where the hips will rest, and tucked in at the sides or pinned to the mattress. Over this is placed the upper sheet and blankets, and over the latter for their protection another sheet is spread; to protect the upper edge of the blankets from soiling, the outer sheet or spread is folded over it, and finally the upper inside sheet folded back over the outer one.

When a patient is placed in bed always pull out the covers a little at the foot of the bed, so that they may not press upon his upturned feet; this is a little point, often neglected, but meaning much to the comfort of the patient.

All of the beds in a ward should be prepared in the same way so as to give a neat and uniform appearance. Patients are very fond of tucking things away under the mattress, a practice which should be carefully prevented by frequent search.

Changing Linen. *The bed linen of an occupied bed may be changed* easily by a single attendant unassisted, and that without seriously disturbing the patient. To change the lower sheet, first loosen all the bed clothes at top, sides, and bottom, remove all the upper covering except a sheet and blanket, and roll up the bottom sheet lengthwise, together with the draw sheet, into a tight roll close to the patient's body; then in like manner make one side of the clean sheet and draw sheet into a roll and place it alongside the first roll, tucking the free edges under the mattress. Now stand on the other side of the bed and with both hands turn the patient on his side with his face toward you; tuck in the rolls under his back, turn him back on his other side on to the clean sheet, then withdraw the soiled one and pull the clean sheet into place.

To remove the upper bedclothing the covers should first be loosened as before, then spread the clean sheet and blanket over them and tuck in at the sides, after which the soiled clothes may be drawn out at the foot.

Bed linen should be changed whenever it is soiled, when a patient is discharged, and at least once a week, depending on the nature of the case; in the infectious fevers it may be necessary to change daily. Even when the sheets are not changed they should be drawn tight, straightened up daily, and brushed clean.

Changing Bed. Sometimes it is more convenient to move the patient to a fresh bed so that the other may be aired and changed; this may be done in several ways. The two beds may be moved close alongside of each other and the patient gently lifted over on the sheet by two attendants, one at the head and the other at the foot; the lifting may be facilitated by rolling the edges of the sheet around a pole on each side, thus forming an improvised litter.

If there is only one attendant a rubber sheet may be pinned to the occupied bed and stretched across the interval to form a smooth surface on which the patient is pulled over on his own sheet; or the mattress on which the patient is lying may be pulled a little way over the other and the patient then rolled over the edge, or drawn over on his own sheet. Where there is only one bed and the mattress is to be changed draw the soiled mattress half way off, and then place the clean one alongside; draw the patient on his sheet from the soiled to the clean mattress, remove the soiled one, and draw the clean mattress in its place.

Care of Bed Patients. A *bed is prepared for an operative case* the same as for any other with the following differences: The pillow is removed and a small rubber sheet covered by a towel pinned to the mattress in its place, this because nausea is less apt to occur if the head is low; in case there should be vomiting a couple of towels are hung over the head of the bed and a basin, several mouth-wipes and a mouth-gag or tongue depressor placed on the bedside table. A number of hot-water bags are placed in the bed, and a blanket is put under the upper sheet; the object of these procedures is to diminish shock by having the bed as warm as possible. Before the patient is placed in the bed the hot-water bags are removed lest the patient in his unconscious condition should be burned without knowing it. The covers on one side of the bed should be turned back to the edge of the mattress in order that the bed may be quickly opened up for the reception of the patient.

Beds for fractures of the lower extremities should be firm and solid so that the sinking in of the bed from the weight of the body may not cause displacement of apparatus, and in order that the patient may be better handled; this is accomplished by placing under the mattress a frame of slats or a number of separate wooden slats. A great variety of fracture beds and invalid beds have been invented, but they are too complicated, and an extemporized bed is better.

To move a patient from one side of the bed to another; standing on the left side, pass the right arm well under the patient's shoulder and back, so that his shoulder will rest upon that of the attendant, and pass the other hand over the patient's other shoulder; lift gently and move over the upper half of the body; then place the right arm under the back lower down, and the left below the hips, and move the lower half of the body over. Whenever the hips are to be moved, always flex the patient's knees, and place the feet upon the bed; this enables the patient to help and lighten the weight. When lifting the shoulders support the head in the hollow of your arm. When moving the patient to one side of the bed always move him toward you.

To lift to the upper part of the bed pass the right arm obliquely under the patient's shoulder and back and the left below the hips, and lift toward the head. If the patient is strong enough to clasp his arms around the attendant's neck he can assist considerably in these movements.

To change the pillows one arm should raise the shoulders and head, while the other hand adjusts the pillow.

To raise the patient to a semi-recumbent position a bed-rest may be used; or a straight-backed chair turned bottom side up and padded with pillows answers very well, or the support may be made of pillows entirely, the first being low down beneath the back and the others packed in above.

Where there is a tendency to slip down in bed, a firm cylindrical pillow about eight inches in diameter is used; this is placed beneath the patient's knees and firmly tied to the head of the bed by broad bandages fastened to the pillow at each end.

Rubber cushions of various shapes and sizes are very useful about a sick-bed, and when there are involuntary discharges a "Kelly pad" or surgical pad is invaluable.

In cases of paralysis or other cases requiring long confinement to bed *air mattresses* and *water mattresses* are used. The air mattresses may be placed on an ordinary bedstead and inflated with the bellows or by the mouth.

The water mattress requires a frame on each side of the bed to keep it from slipping off, and a rubber sheet must be spread over the springs to prevent sticking. After the mattress is in position it is filled with water by a hose or through a funnel; the temperature of the water must be not less than 98° F., that is, the temperature of the body. No pins should be used about water and air beds lest puncture and leakage occur.

Bed Sores. When patients are confined to the bed for long periods of time and their vitality is at the same time very much lowered, as occurs in cases of paralysis, long-continued fever, and in old persons, *bed-sores* are very apt to form; starting as an inflammation of the skin, ulceration and sloughing soon follow and the destruction of tissue is often very deep, even laying bare the bone in many instances, and this with very little pain, so that the patient may be unaware of the existence of the ulcers. The causes of bed-sores are long-continued and uneven pressure, frequent wetting of the skin, such as occurs in incontinence of urine, and uncleanliness. Constant watchfulness is necessary to avoid them in chronic bed cases, especially when the patient must remain in one position. It is much easier, however, to prevent bed-sores than to cure them. The beds must be kept clean and free from crumbs; the sheets and the patient's bed-clothing must be drawn smooth and free of wrinkles and should be changed whenever they get wet or soiled.

The parts of the body most liable to be affected are naturally those most subjected to pressure, the lower part of the back, the shoulders, elbows, and heels. These parts should be washed frequently with soap and water, thoroughly dried, and well sponged with alcohol. After this lanolin may be rubbed in to make the skin supple, followed by dusting with talcum or starch to absorb moisture. In addition, pressure should be taken off the threatened points by frequent changes of position or the use of rubber rings; in the absence of rubber rings, ring-shaped cushions may be made of cotton batting rolled in a tight cylinder, formed into a ring, and then wrapped with a roller bandage. In very chronic cases a water or air bed is necessary.

When the skin is reddened and apparently about to break, it may be protected by strapping with adhesive plaster, or a thin layer of absorbent cotton may be placed over it and held in place with a coating of collodion.

After the bed-sore has formed it is treated like any other ulcer; antiseptic dressings are applied, and after all sloughs have separated, stimulating applications are used.

Baths and Bathing. Baths are given for several purposes, among the more important of which are:

1. To promote cleanliness, 2. To produce sweating or relaxation, 3. To reduce fever, 4. To stimulate the circulation, 5. To quiet the nervous system, 6. To produce counter-irritation.

According to temperature, baths may be: 1. *Tepid,* a little under the temperature of the body; 80° to 90° F.; 2. *Hot,* 100° to 110°F.; 3. *Cold,* 60° to 70° F.

According to extent baths are classified as: 1. General; tub or sponge, and 2. Local; such as Sitz or foot.

Besides water baths, hot-air and steam baths are employed. The wet pack is a modified form of bath.

To promote cleanliness tepid water is used either in the tub or by sponging.

Sponge Bath. To give a *sponge bath* in bed, cover the entire bed with a rubber sheet; on this place a blanket upon which the patient lies with another blanket or sheet over him; provide a pail of tepid water, a slop pail, basin, wash cloth, soap, towels, ammonia, alcohol, mouth-wash, orange stick, nail brush, cotton, and comb. The bathing should be quickly done in sections, the rest of the body being meanwhile protected from exposure.

If the purpose of the sponge bath is to reduce temperature the water should be cold and the whole body may be exposed; in such a case if the patient seems chilly after the bath a glass of hot milk or a little stimulant may be given.

Sedative Bath. The *sedative bath* is for the purpose of quieting excitement and inducing sleep; it may be continued for hours or even days; the temperature of the water is usually just below that of the body—about 96° F.

The arrangement is practically the same as for the Brand bath, but to keep the water from cooling, the tub must be covered with a few pieces of board, on which are placed a rubber sheet and blankets; hot water must be carefully added from time to time to maintain a uniform temperature.

Sweat Bath. *To produce sweating* or *relaxation,* hot-water, hot-air, or steam baths are used.

The *hot-water bath* is given in the tub in the ordinary way except that the head is kept cool by cold cloths or an ice bag. Care must be taken not to continue the bath too long, to the point of fainting; fifteen to twenty minutes is sufficient, after which the patient is taken out and, without drying, placed on hot blankets and covered by three or four more which are wrapped closely about him, up to the neck. Hot weak tea or hot water is given freely to encourage sweating. After about an hour the blankets are gradually removed, and the patient sponged off, under the last one, with alcohol and water, this being followed by a brisk rub with dry towels.

Hot-air and *steam baths* may be given in bed or sitting up. In the first method the bed is covered with a rubber sheet, upon which is placed a blanket on which the patient lies stripped. Over his body are placed two or three bed cradles or extemporized bed cradles (Fig. 125). Bed cradles may be extemporized by tying together at right angles two half barrel-hoops. Over the cradles and tucked in about the patient's neck is another rubber sheet and blanket. Where electric light current is available the simplest and safest method, and the one usually employed, is to suspend several light bulbs from the cradle frame and connect the bulbs with the lighting circuit by means of an extension cord. With the patient securely closed in, the air in the confined space about him quickly becomes heated the moment the current is turned on. In the absence of an electrical installation other methods may be resorted to. At the foot of the bed is placed an oil, gas, or alcohol heater with a section of stove pipe and an elbow to conduct the heat under the bedclothes, or, if steam is to be used, upon the heater is set a tea-kettle with a hose attached to the spout for the same purpose. After the steam or hot air has passed in long enough to get perspiration well started, the upper rubber sheet and the cradles are removed and the blankets tucked in closely around the patient's body, after which the case is managed in the same manner as the hot-water bath.

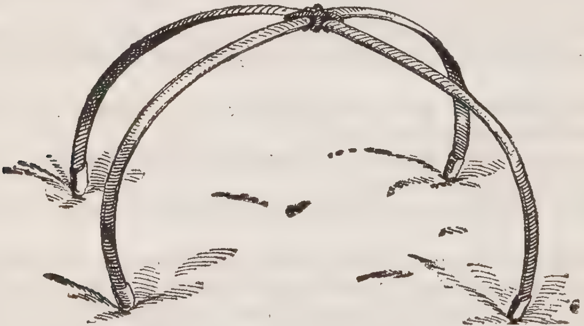


Fig. 125.—Bed Cradle from Barrel Hoops.

To give these baths to a patient sitting up, after removing all clothing he is made to take his seat upon a chair with perforated bottom; under the chair is placed an oil or alcohol lamp, an electric heater, light bulbs, or a pail of water in which are dropped hot stones or bricks. The patient is then surrounded from the neck downward by a rubber sheet and blankets arranged in the manner of a tent; this is a convenient method in the field, and for reclining patients a litter may be rigged up in the same fashion.

Precautions to be used with hot air or vapor baths: 1. Be careful not to burn or exhaust the patient, or to set fire to the bed. 2. Keep an ice-bag on his head. 3. Watch the pulse. 4. Give hot drinks freely. 5. Wrap the patient in a hot dry blanket for an hour after the bath, then rub with alcohol.

Brand Bath. *To reduce fever* we use either the *Brand system* of cold tub baths, cold sponging, or the cold pack. There are also various extemporaneous methods for applying cold for this purpose. The general effect of cold baths, besides reducing the temperature, is to allay nervousness, quiet the circulation, increase excretion, and induce sleep.

The *Brand system* of bathing is used chiefly in typhoid fever. A portable bath tub on wheels is generally employed. The tub is brought to the bedside half filled with water at a temperature of about 90° F.; the naked patient is lifted from the bed and lowered into the tub feet first, and gradually, so as not to produce too much shock. For the purpose of lifting the patient from the bed and supporting him in the tub an openwork stretcher, a hammock, or a cotton blanket with loops sewed in the edges, is usually employed; in the absence of these a binder eighteen inches broad should be fastened across the head of the tub to support the patient's head and shoulders. His head rests upon a circular air cushion and is kept covered with cold compresses; pieces of ice are added to the water so as to reduce the temperature gradually to about 70° F. To ascertain the temperature accurately a bath thermometer is employed. All the time the patient is in the bath the attendants should keep up a vigorous rubbing of his body. The duration of the bath is ordinarily about twenty minutes, but it may be shortened if there is much shivering, and blueness of the lips and finger tips.

When it is time to take the patient out, the tub is covered with a dry sheet, which is wrapped about the patient as he is lifted out and placed on a dry blanket. If shivering persists a hot-water bag may be applied to the feet and a hot drink may be given internally, but he should not be wrapped in blankets. The temperature is taken in the rectum immediately after leaving the bath, and again an hour later. Ordinarily the bath is repeated whenever the temperature goes above 102.5° to 103° F.

Cold sponging has already been described under the *sponge bath.*

Cold Pack. When the patient does not stand the cold tub bath well, or is too weak to bear the moving, the *cold pack* may be employed. In this method the bed is protected by a long rubber sheet, and two sheets folded one or more times and wrung out of water at 70° F. are used. One is placed under the patient and the other over him and tucked in closely about the body and neck; or a single sheet may be used, enveloping the entire body except the head. The packs are changed about every fifteen minutes, and three or four of them generally produce the effects of a single tub bath.

Bed Shower-bath. To give a patient a bath in bed, pass under him a rubber sheet the size of the bed, a bed sheet, and over this a large rubber sheet about three feet wider and two and one-half to three feet longer than the mattress. Attach a small rope or cord to the head and foot of the bed, on each side, about six inches above the mattress, and stretch it firmly. Over this cord pass the large rubber sheet and fasten with clothes pins, thus forming a trough to carry off the water; direct the lower end of the rubber sheet into a pail at the foot of the bed, and raise the head of the bed a few inches on blocks.

Remove the top covers and place a towel over the patient. The water, of desired temperature, may be sprinkled on with a watering pot, or from a pitcher, or a syphon connecting with a pail placed above the bed. If the bath is cold, the patient should be well rubbed during its administration. After it is over, drain off the water, and with a towel wipe the rubber sheet dry, withdraw it from beneath, and dry the patient with the sheet on which he will then lie.

In the field, substitutes for a tub may also be extemporized. An ordinary camp cot may be taken, the canvas bottom punched full of holes and a piece of rubber sheeting tacked across the frame below the canvas in such a way that it will form a gutter draining toward a pail placed at the foot. On this cot the patient is to be placed and cold water sprinkled or poured over him; or an upright frame may be made, to the sides and ends of which rubber sheeting may be attached in such a way as to form an extemporized tub. With a small piece of rubber sheeting, and a tin cup, perforated at the bottom as a sprayer, a cleansing bath may be given even on a litter or a bath board.

Alcohol Bath. The patient is usually rubbed with alcohol after an ordinary bath, or it may be given alone, for its soothing and quieting effect. Fifty per cent alcohol is ordinarily employed, and is well rubbed in by the hands of the attendant. The bedding covering the patient, except the sheet, should be removed, and the lower sheet protected by bath towels; the body is then gone over systematically, one portion at a time, using only enough alcohol to avoid wetting the bed. A pint will usually be sufficient for one bath.

Local Bath. The *foot bath* may be given in bed. It is employed in sprains to control the hemorrhage about the joint, and in internal diseases to draw away the blood from the congested part. For the latter purpose mustard is usually added to the hot water.

To give a mustard foot bath in bed turn up the covers from the foot end of the bed, place a rubber sheet across it, and on this a pail or foot tub full of water, as hot as can be borne. Dissolve a couple of tablespoonfuls of mustard in a cupful of hot water until a uniform cream is formed, and stir it into the pail of hot water. If the dry mustard is added to the pail of water without previous solution, particles of mustard will float around, and may adhere to the legs and produce blisters.

When all is ready the patient, lying on his back, should flex his legs and immerse them in the hot solution, until the skin is quite red. The legs are then withdrawn, dried quickly, and wrapped in a blanket.

In the *Sitz bath* the patient sits in a tub or deep basin of hot water, the feet resting on the floor.

Bakes. Small hot air cabinets for baking different parts of the body are furnished by instrument makers, and especially adapted for the part to be baked.

It is necessary in the use of the appliances, to strictly follow the directions and to take good care to avoid burning the patient. Special protectors are supplied for this purpose, but need to be closely watched.

Electric Light Cabinets. Special appliances are required for these hot-air baths, and directions for their use accompany them.

Enemata, Irrigations, Douches, Catheterization. An *enema* is an injection of fluid into the bowels. When the injection is made into the rectum through a tube passed just within the anus it is known as a *low enema,* or simply an enema; when the liquid is carried high up into the colon through a soft-rubber tube introduced fifteen or eighteen inches, it is known as a *high enema.*

Enemata are further classified according to the purpose for which given, into laxative, nutrient, and medicinal or therapeutic enemata.

Laxative Enema. *Laxative enemata* are of various kinds according to the special indications of the case. The one most commonly used is composed of two or three pints of soap suds, made with any good soap and water, either hot or cold. To give such an enema the patient is placed on his left side, with the hips raised and resting upon a folded towel placed upon a rubber sheet for the protection of the bed. A bed pan or commode should be at hand, and also a towel to control the anus if necessary.

A rubber bulb, or a fountain syringe, may be used, the former being generally considered preferable on account of the intermittent pressure which it permits of; either, however, is effective and safe if properly used.

A soft rectal tube is attached to the tube of the injector by a short piece of glass tubing, the rectal tube lubricated with vaseline or soft soap, and then passed in gently for eight or ten inches. The fluid is made to pass in slowly, the bag in the case of the fountain syringe being raised or lowered as necessary, so as not to cause any pain.

After the entire amount has passed in, the patient is directed to hold it for about fifteen or twenty minutes if possible, and may be assisted by pressing a towel firmly against the anus. The longer the fluid is retained the higher up the contractions of the bowel extend and the more complete the resulting evacuation. Should a more active enema be necessary thirty grammes of Epsom salt and fifteen Cc. of turpentine may be added to the soap suds, or sixty Cc. of castor oil and fifteen Cc. of turpentine may precede the suds by half an hour. Fifteen Cc. of glycerine diluted with an equal amount of water, and given with a small hard-rubber syringe, makes a very effective enema.

Nutrient Enema. *The nutrient enema* is always given high, as the rectum itself has very little absorbent power and still less digestive capacity; if the bowels are loaded they must first be emptied by a laxative enema. Nutrient enemata must not exceed one hundred and twenty-five Cc. in bulk, so as not to cause peristalsis and lead to their own rejection; they must also be concentrated, nonirritant, and predigested or easily digestible. They should not be repeated oftener than once in four or six hours.

Among the food preparations most suitable for this purpose are peptonized milk, with or without the addition of an egg, and beef juice or beef extract.

A nutrient enema is given through a rectal tube or large catheter, warmed, well oiled, and introduced for about twelve to fifteen inches; in the outer end of the tube a funnel is placed, and the liquid food slowly poured in from a pitcher. When nutrient enemata are given frequently the bowel should be gently washed out with warm water before each one; the tube and funnel are used for the washing, the latter being alternately raised and lowered before all the water has run out, so as to secure siphon action.

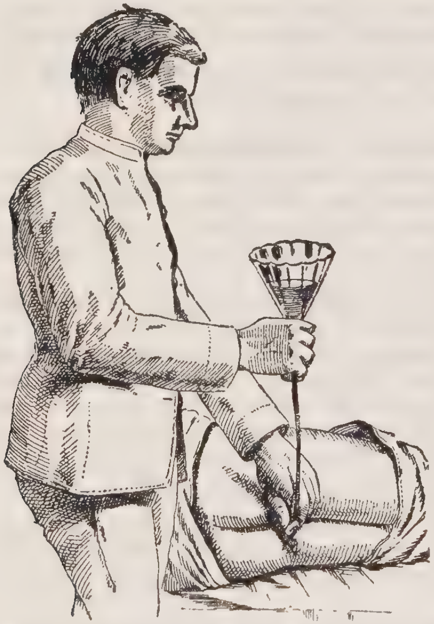


Fig. 126.—Irrigation of the Bowels. First step.

Water to relieve thirst is often given by high enema; for this purpose as much as a pint should be used.

Murphy Drip. *Proctoclysis* or the *Murphy Drip* is the administration of normal salt solution, glucose solution, or plain water into the lower bowel by way of the anus. The solution given should be at 118 degrees F. and regulated, by a clip on the tubing, so that the flow does not exceed from 40 to 60 drops per minute. A glass container or fountain syringe, with a medium sized catheter attached to the lower end of the tubing, should be used.

Medicinal Enema. *Medicinal enemata* may be given for their general effect, as when chloral, opium, or stimulants are used, or for their local effect, on inflammation or hemorrhage, when astringents, emollients, or antiseptics are employed. The last class of medicines is, however, usually employed by irrigation instead of enema. The most common emollient enema is the well-known starch-and-laudanum mixture. To prepare it take a tablespoonful of ordinary laundry starch, add enough cold water to dissolve it, and then sufficient boiling water to form a thin paste; into this stir fifteen to twenty drops of laudanum, and inject, while warm, with a hard-rubber syringe.

Rectal Irrigation. An *irrigation* differs from an enema in that it is desired that a considerable portion of the liquid introduced shall be absorbed, and that the remainder shall be allowed to flow away at once. The irrigation may be given for cleansing purposes only, or medicinal agents such as nitrate of silver or quinine may be employed. Before the funnel is lowered, enough fluid should be introduced to gently distend the bowel without causing pain; it is important to see that the funnel is lowered while some fluid is still visible; otherwise there is difficulty in starting the outward flow (Figs. 126, 127).

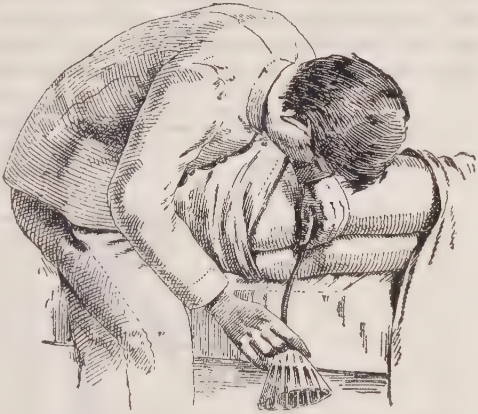


FIG. 127.—Irrigation of the Bowels. Second step.

The tubes and syringes used in giving enemata and irrigations must be kept thoroughly clean; for this purpose, after use a stream of water should be allowed to run over and through them, after which the syringe should be hung up to dry, and the tubes and nozzles placed in an antiseptic solution. When the tubes or nozzles have been used in an infectious case they should be boiled before being employed for another patient.

Urethral Injections. *Urethral injections* are used in gonorrhea. In the hospital these injections are given under the supervision of an attendant, who should instruct the patient how to take them correctly. Having placed a basin on a chair in front of him, or standing in front of the urinal, the patient should first pass his water to wash all the pus out of the urethra.

The syringe is then filled and the nozzle inserted in the meatus and held there firmly with thumb and forefinger of the left hand, after which the piston is driven slowly home, the syringe withdrawn, and the urethra firmly compressed for a couple of minutes in order to retain the injection. At least two syringefuls are used each time.

Douches. A douche is a stream or jet of water propelled with some force. Spinal, vaginal, nasal, pharyngeal, eye, and aural douches are employed, the latter, or ear douche, being the most frequently used in military hospitals.

The *spinal douche.* The patient should sit on a board across the end of the tub furthest from the spigot, and with his back toward the spigot. Use the spray as directed. If the spray is to be hot test it first on your own arm. If the patient is unable to sit up, the douche may be given in bed, which is prepared as for a *bed-bath.*

The *nasal douche.* Use a fountain syringe with a nasal tip. Incline the patient's head forward and to one side so that the nostril of entrance is uppermost; if one nostril is obstructed this should be the entrance; tell the patient to keep the mouth open and breathe through the mouth and not to cough or swallow, this to prevent the passage of the fluid into the eustachian tube; use no force; hold the irrigator only two or three inches above the patient's nose; have the water hot.

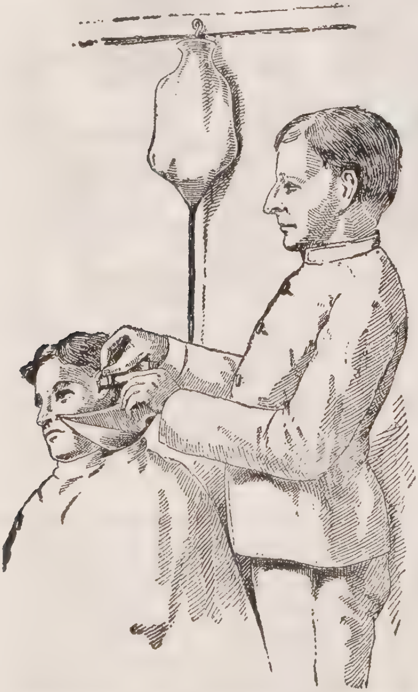


FIG. 128.—Syringing the Ear.

The *eye douche.* Use warm boric acid solution. Arrange the patient so that the eye to be douched is lower than the other one; wipe off any secretion with a wet cotton sponge, from within outward; evert one lid and direct the solution over it from within outward, holding the basin in such a position as to catch the flow; treat the other lid in the same way; if drops are to be put in afterward place them at the outer angle of the eye so that they will not immediately escape through the tear duct.

The aural or *ear douche* is used for cleansing purposes, or to remove foreign bodies, especially hardened wax. Either a fountain syringe with a straight glass medicine dropper as a nozzle, or a hard-rubber syringe, is employed. The former is to be preferred, as the pressure can be more easily regulated.

To remove hardened wax a warm, five-per-cent solution of soda is employed; the coat and collar of the patient having been removed and a towel placed about his neck, he sits in a chair with the head inclined toward the affected side; a basin or bowl is held firmly against the neck just below but not touching the lobe of the ear; the ear is then drawn upward and forward to straighten the canal, and the tip of the nozzle placed against the upper wall, along which the injection of water is directed, with the object of passing behind the plug of wax and washing it out, in the return flow along the floor of the ear (Fig. 128). A quart or more of water may be used at a time and repeated until the mass comes away in one piece, or in fragments. When the wax is removed the ear should be dried out with a wisp of cotton, a little of which is left in the canal for a day or two until the sensitiveness has subsided.

Catheterization. *Catheterization* is the art of drawing off the urine from the bladder by the aid of a catheter. The dangers of catheterization are injury to the urethra from undue force, and cystitis or inflammation of the bladder caused by the introduction of germs on an unclean catheter. The precautions to be taken are absolute cleanliness of everything which may come in contact with the catheter, and avoidance of all force in introduction. The catheter to be used should usually be of soft rubber only; failing with this a noncommissioned officer may use a silver instrument.

To introduce a soft-rubber catheter it is first washed in running water, then wrapped in gauze or a towel and boiled five minutes; the attendant washes his hands and the penis of the patient with hot water and soap, followed by an antiseptic solution, and surrounds the base of the penis with a clean towel; the catheter is then lubricated with sterilized oil, or vaseline, held in dressing forceps, and gently passed in until the escape of urine announces that it has reached the bladder. In passing the catheter the penis should be held in one hand by the attendant and first turned up towards the patient's abdomen; then as the neck of the bladder is reached, gradually lowered to a position between the thighs. Should an obstruction be met with, the catheter is withdrawn a little, and again pushed on as before. After the flow of urine has ceased, the instrument is gently withdrawn, taking care to compress the end between the fingers as the last portion is withdrawn from the urethra, in order to prevent the urine remaining in the catheter from dripping out on the bed. After use the catheter should be thoroughly washed in running water and either hung up to dry, or placed in a boric-acid solution.

Irrigation of the bladder for cystitis and other diseases is done in much the same manner as irrigation of the intestines, using either a single or double current catheter.

Catheterization of the ureter is always done by the physician; the attendant's duties are to see to the sterilization of the instruments, and that specimens of the urine from the two kidneys are kept quite separate, for this purpose he marks the ureteral catheters, as well as the necessary vessels, "right" and "left."

External Applications. Among the external applications most commonly used are heat and cold, lotions, counter-irritants, and caustics.

Hot. *The application of heat* may be general or local; the general application has already been described. The local effects of heat are to relieve pain, allay inflammation, and relax spasm.

Dry heat is applied in the form of the various dry hot-air apparatus, electric heaters, hot-water bags, bottles, or cans, salt bags and hop bags, hot bricks, etc. The dry hot-air apparatus must be used with considerable care, and according to the directions which accompany each appliance. Bags, bottles, or tins of hot water should be inclosed in a flannel or blanket cover, or otherwise wrapped, to prevent danger of burning; when used about unconscious or paralyzed patients especially, the greatest care and watchfulness should be employed to prevent accidents. Hot-water bags should be filled a little more than half full and all the air expelled before the top is screwed on; this makes them lighter and more easily adjusted. They should be examined closely before use to see that they do not leak. Hot bottles are not very safe, as they are apt to crack or burst. The great advantage of bricks is that they retain the heat a long time, but they are very heavy and awkward.

Moist heat is more penetrating and more relaxing than dry heat. It is applied in the form of poultices, or fomentations or stupes.

Poultices are made of various materials; anything which will hold heat and moisture is adapted to the purpose; flaxseed meal is the time-honored basis for poultices, and where the skin is unbroken answers very well; but where a wound or abrasion exists such a poultice is a veritable culture-bed for bacteria, and should be replaced by layers of gauze wrung out of a hot antiseptic solution, and covered by a layer of cotton batting and oil silk.

To make a flaxseed poultice stir the meal (1 full cup) slowly into boiling water (1½ cups) until a thick paste is formed; boil for a few minutes, then beat briskly with a spoon until the admixture of air makes it light; spread with a spatula or knife to the thickness of one-fourth or one-half inch upon strong muslin, leaving a free border of an inch all the way round. Then cover the face of the poultice with gauze, or oil it with vaseline, and turn over the edges. Apply, and then cover with a layer of cotton and oil silk. Such a poultice should be changed once every two or three hours. The fresh poultice should be ready before the old one is removed, and they should never be used a second time. Oatmeal or cornmeal will do very well in the absence of flaxseed.

A *fomentation* or *stupe* consists of a couple of layers of flannel wrung out of hot water and covered with cotton and oil silk. A few drops of laudanum or turpentine are sometimes sprinkled upon the flannel after it is wrung out, or added to the hot water. To prepare a stupe, dip the flannel in very hot water and wring it out quickly with a stupe wringer, composed of a strip of muslin about eighteen inches square with a stick run through a hem at each end; any stupe which can be wrung out with the hands is not hot enough to be of much value. Stupes must be changed oftener than poultices—about once or twice an hour.

Cold. *Cold is used locally* to relieve pain and reduce inflammation. It may be applied in the form of compresses, the ice bag, or cold coils.

Cold compresses consist of a couple of layers of gauze dipped in ice water, or laid upon ice and afterward applied to the part; they must be renewed constantly before they get warm. A large piece of ice is placed in a basin upon a towel or piece of flannel; upon this the compresses, first soaked in water, are placed; as a fresh one is taken the old one is put back upon the ice.

The *ice bag* is filled about half full of finely crushed ice mixed with a little salt, and care taken to expel the air before it is closed. A layer of dry lint or cotton is placed between the bag and the skin, to prevent pain or even frost-bite. Care must be taken to refill the bag before all the ice melts; nothing is more common than to see neglect of this necessary rule. To crush the ice conveniently, a stout canvas bag and mallet should always be at hand.

Ice-water coils are made of rubber tubing sewed upon a piece of rubber sheeting of such size and shape as to fit the part to be kept cool; several feet of tubing are left free at each end to act as a siphon; one end is placed in a pail of ice water above the patient's head and the other in a basin on the floor, and the siphon started.

Lotions. *Lotions* are medicated solutions used externally. Evaporating lotions are applied on a single layer or two layers of gauze, and left exposed to the air. With other lotions several layers are used and covered with a protective.

Counter-Irritants. *Counter-irritants* are substances used to produce irritation of the skin in order to relieve pain, congestion, or inflammation in a part beneath or even at a distance; they accomplish this by dilating the superficial blood-vessels, and at the same time by reflex action causing a contraction of the deeper ones, thus drawing the blood away from the affected part. Counter-irritants are classified as: *rubefacients,* those causing only redness of the skin; *vesicants,* those producing blisters; and the *cautery.*

Mustard, turpentine, iodine, liniments, and "cups" are rubefacients. Mustard is used in the form of foot bath, poultice, plaster, and leaves. The first two have already been described. Mustard plasters ready for immediate application are now standard commercial articles. When these are not available a *mustard plaster* is prepared by mixing one part of mustard with one to five parts of flour according to the strength desired; sufficient tepid water is slowly added to make a smooth paste, which is then evenly spread on paper or muslin and covered with a layer of gauze or tissue paper. The plaster is applied to the part and held in place by a bandage or adhesive-plaster strips. Hot water or vinegar should never be employed in making a mustard plaster, as either causes the evaporation of the volatile oil of mustard. The plaster should be left on for twenty minutes or a half-hour, the purpose being to produce redness of the skin. In old persons and children the effect should be closely watched, to prevent blistering. After removal, any adherent particles of mustard should be wiped away and the surface dusted with starch or oiled with vaseline.

Mustard leaves are ready prepared and require only to be dipped in tepid water before use; the objection to them is that they have usually lost their strength.

Turpentine is used in the form of stupes above described.

Iodine in the form of tincture is painted on the part, one or two coats, with a camel's-hair brush or an ordinary gauze swab. Where the skin is thin and moist, as in the groin or in young children, it may blister. When the burning caused by it is excessive, it may be stopped by washing off the iodine with alcohol. The stain may be removed by washing with ammonia or thiosulphate of soda.

The various stimulating *liniments* have some value as counterirritants, though they are chiefly useful by virtue of the massage by which they are applied.

Dry cups act not only as a counter-irritant, but they also leave an actual extravasation of blood beneath the skin; they cannot be applied over bony or irregular surfaces. The number is usually designated, from a dozen to a hundred; half a dozen or more may be in place at a time and they may be left on about five minutes unless they drop off sooner. To apply them we need a dozen cups or small tumblers, an alcohol lamp, a cup of alcohol, a swab, matches, and towels. The swab is prepared by wrapping tightly with cotton the end of a small stick, probe, or wire.

Dip the swab in the alcohol, light it, hold it for a moment inside the cup to exhaust the air, then quickly apply the cup to the part; repeat the motion as rapidly as possible. Be careful to avoid burning the patient by dropping ignited alcohol upon him, or by undue heating of the edges of the cup. To remove the cup hold it in one hand and with the index finger of the other press the skin just underneath the edge of the cup so as to admit the air, when the cup will fall off. Before reapplying the same cups they must be wiped dry inside with a towel. Wet cupping is done in the same way as dry cupping, only the skin is first scarified by means of a special instrument known as a scarifier.

Bier's cups, which have an attached rubber bulb as an exhaust pump, are used not only as a counter-irritant, but to relieve inflamation and pain by increasing the amount of blood in a part.

Vesication or *blistering* is used when we wish a more decided effect than can be obtained from rubefacients. The principal vesicant is *Cantharides* in the form of plaster or collodion. Before the application of a blister the skin should be washed, and shaved if necessary; a piece of plaster of the designated size is then moistened with a little alcohol, applied to the part, and held in place by a bandage; strips of adhesive plaster are objectionable because they may exert painful pressure on the blister as it rises.

The cantharides is left on until a blister forms, usually eight to ten hours; at the end of that time if there is still no blister the plaster should be removed and a poultice applied; this will usually raise the blister promptly. The cantharidal collodion is used by painting on a couple of coats and covering with cotton or oil silk. When a blister is required to be raised quickly it is done by soaking a piece of lint with ammonia or chloroform, applying it to the part, and covering with a watch glass or cupping glass to prevent evaporation. A still more prompt effect may be obtained from the actual cautery.

After the blister is raised its management will depend upon the directions of the physician. It may be protected by a layer of cotton and left to be absorbed unbroken, or it may be punctured with a sterile needle and the fluid allowed to escape, or the whole of the cuticle may be cut away and the raw surface dressed.

The *actual cautery* is simply a hot metal instrument applied to the skin usually at a cherry-red heat; it is used to relieve pain, cause the absorption of effusion, and to control bleeding. The form used in the army is the *Paquelin cautery,* an instrument in which the platinum tips, first heated in an alcohol flame, are maintained incandescent by pumping into them the vapor of benzine; it is a valuable appliance, but requires care in handling, as it readily gets out of order. The benzine is poured into the reservoir until the lint or sponge which it contains is just saturated; any free liquid might get into the tube and cause an explosion.

Caustics. Among the caustics in common use are nitrate of silver (lunar caustic), sulphate of copper (blue stone), and nitric acid.

Lunar caustic is kept in a caustic holder; it should be cleaned before use with a piece of moist cotton, and dried after use; it should not be allowed to touch the hands or linen, because it makes a black stain. To give a point to a stick of lunar caustic rub it on wet lint; never attempt to scrape it.

Blue stone is used especially for touching granulated eye-lids; the crystal should be ground to a point on a fine stone.

Nitric acid is used for burning (disinfecting) chancroids. Dry the ulcer and drop on it a few drops of four-per-cent solution of cocaine; after a minute or two dry again, dip the wood end of a match in the nitric acid and touch thoroughly every point of the sore; then pour cold water over the part.

Temperature, Pulse, and Respiration. The *normal temperature* of the human body is about 98.6° F. (37° C.), but the normal varies within certain limits according to the part of the body in which the temperature is taken, and according to the time of day. The temperature is ordinarily taken in the mouth, in the axilla, or in the rectum; the axillary temperature is about one-fourth of a degree lower than that taken in the mouth, while the rectal temperature is a fourth to a half a degree higher. The highest temperature is usually recorded about four o'clock in the afternoon, and the lowest about two o'clock in the morning; the difference may be as much as a degree. A variation of temperature below 97.5° F. or above 99° F. may be regarded as abnormal and an indication of disease.

Abnormal temperature may be subnormal or elevated.

Subnormal temperatures are produced by anything which causes a general depression of the vital powers. Shock, hemorrhage, heat exhaustion, exhausting disease, may all cause subnormal temperature; when the depression of temperature is below 96° F. the condition is one of *collapse.*

Elevation of temperature, or *fever,* means either that more heat is being produced than usual or that it is not being gotton rid of promptly; usually both conditions are present. You will remember that the evaporation of perspiration is one of the most important provisions of nature for regulating temperature, and as a matter of fact in fever the skin will usually be found to be very dry. A fever of 100–103° F. is regarded as *moderate;* 103–105° F. as *high fever,* while temperatures above 105° F. are denominated *hyperpyrexia.*

A depression of temperature of several degrees is usually of much more importance than a corresponding elevation; thus a depression of three and a half degrees would give a temperature of 95° F., or the temperature of collapse, a condition which means speedy death unless prompt action takes place. On the other hand, an elevation of three and a half degrees would only give 102° F., a temperature by no means alarming. Hyperpyrexia, however, temperatures 106° to 109° F., is very dangerous, although recovery has often followed prompt remedial measures.

The instrument for measuring the temperature of the body is called a *clinical* or *self-registering thermometer.* The self-registering feature is secured by a break in the mercurial column corresponding to a constriction in the glass. When the mercury column has risen above the normal line, which is usually indicated by an arrow, it must be shaken down by a sweeping motion of the arm before the thermometer is used again.

The Fahrenheit scale is usually employed in this country, but the thermometers issued to the army are generally graduated in the Centigrade scale also. The normal in the Centigrade is 37°, 40° C. corresponding to 104° F. To convert Fahrenheit degrees into Centigrade subtract 32 and multiply by 5/9. For example:

$$98.6\text{F.} = [(98.6 - 32) \times .5/9] = 37^\circ\ \text{C.}$$

Conversely, to convert Centigrade to Fahrenheit multiply by 9/5 and add 32; example:

$$37^\circ\ \text{C.} = [(37 \times 9/5) + 32] = 98.6^\circ\ \text{F.}$$

When in doubt about a thermometer compare it with one of known accuracy, by simultaneous observations on the same patient.

Temperatures are ordinarily taken in the mouth, the bulb being placed under the tongue, and the patient directed to close his lips but not his teeth, upon it If the patient is very weak it may be necessary for the nurse to hold the thermometer in his mouth. With modern thermometers three minutes is ample for mouth temperatures. When the patient is delirious or unconscious, or is a child, it is not safe to take the temperature in the mouth.

In infants and children the temperature is usually taken in the rectum; the bulb well oiled is introduced for about an inch and a half; one or two minutes' time is sufficient.

To take a temperature in the axilla, the arm pit is first wiped dry, the bulb put in place, and the arm carried across the chest so as to bring the opposing skin surfaces in close contact with the thermometer; a little longer time is required than in the mouth or rectum—about five minutes usually.

Thermometers when not in use should be kept in an antiseptic solution, and resting on a bed of cotton; bichloride of mercury is objectionable for this purpose as it soon removes the markings on the glass. Before using for another patient, the thermometer should be rinsed in clean water and wiped dry.

Fevers are classified as *continued, remittent,* or *intermittent. A continued fever* is one in which the temperature is continually above normal, and there is a difference of not more than about one degree between morning and evening; typhoid fever in the second week is usually a continued fever. *In remittent fever* there is a decided drop some time in the twenty-four hours, but the temperature does not reach normal. *In the intermittent* fevers the temperature at certain intervals falls to or below the normal; malarial fevers are apt to be remittent or intermittent.

In keeping a record of fevers *charts* or *thermographs* are employed. Temperatures are usually recorded morning and evening, but in typhoid fever and other serious fevers this is generally done every three hours or oftener. In marking charts a dot is placed on the point at which the temperature stands, and these dots are connected by straight lines drawn with the aid of a ruler.

Pulse. The *normal pulse rate* in the adult is about seventy-two to the minute; it varies, however, from about sixty-five to seventy-five. In children it is much more rapid. In fevers it rises considerably.

The condition of the pulse is very important, as it usually accurately indicates the condition of the heart and vital powers.

The pulse may be taken by laying the fingers gently on any superficial artery, but usually the radial artery is the most convenient; the temporal is also frequently used for the purpose. The points to be noted are *frequency, regularity, intermittence, fullness, tension* and *strength.* Frequency of the pulse is increased by exercise, food, excitement, and position; the pulse is more frequent in the standing position than when lying down or sitting.

An *irritable pulse* is one which is easily excited; an *intermittent pulse* is one which drops a beat now and then; a *dicrotic pulse* occurs in extreme weakness, as in typhoid fever, and consists of two waves to each beat so that the rate may appear twice as fast as the actual pulsations of the heart.

Respiration. *The normal respirations* occur at the rate of about eighteen to the minute. In disease there occur marked variations in the frequency and character of the respirations; in narcotic poisonings the respirations are very slow, while in pneumonia and peritonitis they are very rapid.

In taking respirations one should notice their *frequency* and *regularity,* whether *difficult* or *easy, noisy* or *quiet, deep* or *shallow,* and whether *symmetrical,* that is to say, the same on the two sides of the chest.

Cheyne-Stokes respiration is the peculiar type of breathing which occurs in certain diseases of the heart and kidneys. The respirations gradually increase in frequency and intensity up to a certain point, then slowly decrease until they seem to entirely cease; after a short pause the same course is gone through with again.

In *stertorous breathing* there is a loud snoring noise with inspiration.

Dyspnea means difficult or painful breathing.

In taking respirations it must be remembered that they are in a measure under the control of the will; therefore, they must be taken without the patient's knowledge, and this is done by laying the arm across the chest in taking the pulse, and then without removing the fingers from the wrist taking the respiration while appearing to take the pulse. With a little practice an attendant should become so expert that he can take the pulse and respiration of a sleeping patient without arousing him.

In the normal condition, the pulse, temperature, and respiration rates have a definite relation to each other, and the three factors should always be considered together in disease, as disturbance in the normal ratio may have the most important meaning.

In health the pulse rate is about four times the respiration rate; when the respiration rate is increased to a third or a half of the pulse rate it is usually an indication of disease of the lungs, such as pneumonia. In fevers, when the temperature rises the pulse becomes proportionally more rapid; if instead of rising with the temperature the pulse slowly falls, an important sign of yellow fever is present; if, on the other hand, the pulse rate becomes more rapid than that which is used with a given temperature, it is an indication of weakness and diminished vital powers.

Symptoms and Clinical Record. One of the most important duties of a nurse is to cultivate the habit of observing symptoms accurately and reporting them clearly and intelligently.

The physician can only be with the patient a short time, and he must depend upon his nurse to inform him of everything that takes place in his absence; the nurse may thus obtain information of the greatest value in diagnosis and treatment. *Symptoms* may be divided into two classes: *subjective symptoms,* those which are only apparent to the patient himself, such as pain; and *objective symptoms,* those which are apparent to others, such as redness and swelling. Sometimes the symptoms are *feigned,* when the patient is said to be *malingering;* it is always safer to assume, however, that the symptoms are real until the contrary is proved.

Not only must the nurse cultivate the habit of observing symptoms, but he must learn how to attach to them their relative importance. Emergencies continually arise when he must determine what is to be done; are the symptoms of sufficient gravity to cause him to call in the noncommissioned officer or send for the ward officer? Shall he loosen a bandage or give a stimulant on his own responsibility?

The observations should commence with the giving of the first bath or putting the patient to bed. Are there any scars, wounds, or eruptions upon the body? Is the patient emaciated or dropsical? Does he appear weak and ill? The *attitude* and *expression* are sometimes characteristic. In inflammation of one lung the patient usually lies on that side so as to give free play to the uninjured lung. In appendicitis or peritonitis he is apt to lie on the back, with one or both legs drawn up.

Slipping down toward the foot of the bed means weakness, and is therefore unfavorable.

With colic the patient often lies on the abdomen, with a pillow pressed against it; but when the pain is inflammatory he can not stand the pressure.

When the patient can not breathe while lying down there is usually trouble with the heart or lungs.

Great restlessness is often a bad sign.

An anxious look is unfavorable, while a tranquil expression is of the opposite import.

Rattling in the chest, with shortness of breath and bluish tint of the lips, is a sign of edema of the lungs and often indicates approaching death.

The *mental condition* gives important indications: whether the patient is conscious or unconscious; rational or irrational; depressed or excited or muttering. The speech may be thick, or clear, or hoarse.

The *eyes* are to be observed; whether the pupils are dilated or contracted, or unequal; whether there is any squinting; any yellowness or congestion of the conjunctiva.

The *hearing* may be painfully acute, or it may be defective; there may be a discharge from the ear.

Bad taste may be a complaint.

The *skin,* especially of the face, may give important indications; it may be pale, flushed, livid, or jaundiced; hot, cold, dry, or moist. A moist skin with high temperature is usually a bad omen. A peculiar red spot high up on either cheek is often indicative of pneumonia or consumption; pallor about the lips is a sign of nausea. Then we have the waxy hue of Bright's disease, and the rashes of the eruptive fevers; the sallow color of narcotic users, the pallor of anaemia, the blue tint of cyanosis, the bronzing of Addison's disease. Bluish spots, about the size of a finger nail, distributed about the trunk are a sure sign of body vermin.

The *tongue* offers many valuable indications; note whether it is dry or moist, clean or coated, large or small, bitten, or indented on the edges by the teeth. In malarial fevers and digestive disorders the tongue is apt to be heavily coated and indented by the teeth; in typhoid fever it is first moist and coated, but soon becomes dry and cracked; when such a tongue becomes moist and begins to clean up from the edges it is a very favorable sign. In scarlet fever the bright-red papillæ showing through the white fur produce the characteristic *strawberry tongue.* In yellow fever the tongue is small, red, and pointed.

Note at the same time the *condition of the mouth and teeth;* white slightly raised patches on the inside of the lips and cheeks, at the corners of the mouth, and in the throat are frequently mucous patches, a sign of syphilis. The dark accumulations which occur on the teeth in fevers are known as *sordes;* their presence indicates that the mouth has not been well cared for.

The *odor of the breath* is often significant; sweet in diabetes, urinous in uremia, fetid in disorders of the stomach, gangrene of the lungs, bad teeth, etc.

The state of the *appetite* is of importance; it is usually lost in acute diseases, but occassionally is excessive. Observe with care how much food the patient actually takes. Nausea is often present with or without vomiting. The frequency of the *vomiting,* whether it is painful, and the character of the matter vomited should be noted. Usually the vomitus consists of food at first, but this may be followed by bile, mucus, or blood. When blood has been retained in the stomach some time it becomes brownish in color, like coffee grounds; vomitus of this character is seen in yellow fever. Vomiting of fecal matter is a sign of great importance, and indicates obstruction of the bowels. Great thirst is usually an indication of fever or hemorrhage.

The number and character of the *stools* should be noted. Blood, unless fresh, gives the stools a black, tarry appearance; in jaundice they are generally clay-colored; bismuth and iron color them black; they may be liquid or solid, and may contain mucus, pus, blood, or worms.

Tenesmus, a constant desire to evacuate the bowels, is present in dysentery.

Belching of gas, rumblings in the bowels and distention of the abdomen are signs to be noted.

The *urinary functions* should be carefully noted, and in special cases the amount passed carefully measured. In both *suppression* and *retention* no urine is passed, but in the former, which is much the more serious condition, no urine is secreted; it may be distinguished from retention, which is caused by some obstacle to the escape of urine from the bladder, by the fact that in suppression the bladder may be shown to be empty by tapping with the finger just above the pubis; a hollow sound is produced if there is no urine in the bladder.

Incontinence of urine, that is, the inability to hold it, may be associated with retention, so that the mere fact of constant dribbling does not preclude the possibility of the bladder being distended.

The quantity of urine should be measured and the frequency with which it is passed noted. Useful information may also be obtained from observation of its color and odor. Blood gives it a smoky or red hue, pus a milky appearance, and mucus a stringy condition. Bile imparts a greenish tinge, as does carbolic acid, while santonin gives a bright-yellow color. Many drugs and vegetables impart a characteristic odor to urine.

Cough is an indication of some irritation of the air passages; the matters coughed up are called *sputa.* When there is no sputum the cough is said to be dry. The cough may be tight, loose, or painful; then there is the hoarse, crowing cough of croup or diphtheria, the spasmodic whoop of whooping cough, the wheezing cough of asthma, the painful cough of pleurisy, and the peculiar rasping cough of aortic aneurism. The character of the sputum varies; in *bronchitis* it is white or yellow and mucous; in *pneumonia* it is reddish and very sticky; in *tuberculosis* it is at first mucous and frothy, later it is purulent with cheesy nodules, and sometimes stained with blood.

In gangrene of the lung the sputum is unbearably offensive.

Hiccough, when it is persistent in the later stages of acute diseases, is often a very grave sign.

When a patient complains of feeling cold take his temperature; a chill is nearly always accompanied by fever. *Chills* frequently accompany the onset of acute disease; when they occur *in the course of inflammation* they often indicate suppuration; in *malaria,* while severe, they are not usually dangerous.

Hemorrhage from any part of the body is always significant; nosebleed is often one of the early signs of typhoid fever.

Pain is one of the most valuable signs which we possess, as it often points toward the location of the disease. The kind of pain should be described and whether it is constant or intermittent, severe or slight. Exaggerated sensitiveness to touch is called *hyperesthesia* and diminished sensibility *anesthesia;* the latter is often associated with loss of muscular power or *paralysis;* paralysis of the lower half of the body is called *paraplegia;* of a lateral half *hemiplegia.*

Disorders of motion include picking at the bedclothes, always a bad sign, twitching of the tendons (*subsultus*), slight spasms, and local or general convulsions. In convulsions always note the parts affected and whether the attack is attended with loss of consciousness.

Under *disorders of consciousness* are included *delusions* and *hallucinations, delirium, stupor, and coma.*

The character of the delusions should be noted, whether occasional or habitual, quiet or noisy; in stupor note whether the patient can be aroused; if he can not, it is coma, a very serious condition. *Coma vigil* is a combination of sleeplessness, with partial unconsciousness, and is always a symptom of bad omen.

The amount and character of *sleep* should be recorded; patients' statements on this point must be accepted with caution.

That nothing concerning the patient's condition may be forgotten, *clinical records* are kept. The blank forms for this purpose are of a uniform size, 3½" by 8", perforated at the top so that on the completion of the case the various sheets pertaining to it may be assembled and filed together.

Collection of Specimens. It is usually necessary to keep specimens of urine, feces, sputum, or vomitus, for the inspection of the ward officer. Ordinarily these are best kept in the vessel in which they are received. They should be placed in a cool place and protected from dust. In special cases medical officers direct that the entire amount of urine voided in a twenty-four hour (1 day) period be kept. These are commonly alluded to as a "24 *hour specimen.*" Large glass jars are provided for this purpose.

If sterile specimens are needed, the vessel in which they are received and to be kept, should be sterilized by boiling or otherwise.

If specimens of urine are to be kept for any length of time, it may be necessary to add a few drops of formalin or chloroform to them, to prevent decomposition.

Bandaging. Bandaging must be taught practically, one-half of a class practising on the other half. Three general types of bandages are used in the army; roller, tailed, and triangular.

Roller bandages are now universally employed in hospitals. Our field wound dressings are virtually an adaptation of the tailed bandage principle. The triangular bandage is gradually being abandoned for the general use to which it was formerly put. Its principal rôles now are those of an arm-sling, and of a support in securing splints.

Bandages are used to fix splints and dressings, to apply pressure to a part, to support or control the circulation of a part, and, in combination with the dressing, to prevent foreign matter which would cause infection from getting into a wound. When we speak of an *occlusive dressing* we have the latter object in mind.

Roller bandages consist of strips of cloth of variable length and width. To apply them properly requires care, time, and constant practice.

The chief materials from which rollers are made are muslin, cheese cloth, gauze, flannel, and rubber; each has its own special qualities.

The most general and useful sizes are as follows:

For the head, 2 inches wide and 5 yards long.

For the upper limb, 2½ inches wide and 5 to 10 yards long.

For the trunk, 4 inches wide and 5 to 10 yards long.

For the lower limb, 3 inches wide and 5 to 10 yards long.

For the fingers, ¾ of an inch wide and 1 to 2 yards long.

Commercially, they are supplied sterile in tightly rolled form, or compressed in blocks; with a sealed wax or other impervious paper covering.

Making Bandages. If prepared locally roller bandages should be torn, not cut. To prepare a number at one time take a piece of muslin or gauze of the required length, tear off the selvage, with the scissors split one end into the required widths, tear down for a couple of feet, separate the alternate strips, hand one set to one person and the other to another. Each now pulls firmly until the piece of cloth is torn through the entire length.

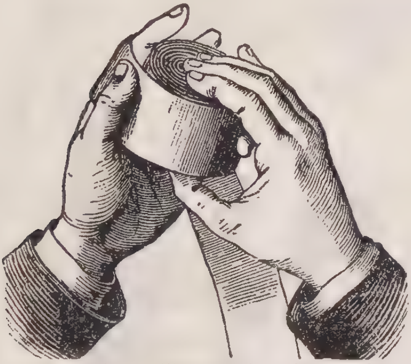


FIG. 129.—Rolling Bandage by Hand.

Besides a machine for rolling bandages, there are two methods of rolling by hand. Take a couple of feet of the end of the bandage and fold repeatedly upon itself until a firm mass is formed; then sitting in a chair cover the right leg, foot, and adjacent floor with a clean towel or sheet, place the small roll on the thigh, the loose part of the bandage extending down over the knee to the floor, and roll toward the knee; when the roll reaches the knee draw it up to the groin and then repeat the motions.

After a firm roll is made in this manner it may be finished by hand if desired; in this method the bandage is grasped as shown in Fig. 129 and rolled by alternate movements of pronation and supination of each hand.

Rules for Bandaging. 1. Place the limb in the position it is to occupy. If the arm is bandaged in the straight position and then bent, the bandage will cut in at the bend of the elbow and stop the circulation.

2. Begin at the extremity of the limb, the ends of the fingers for the upper extremity, the tips of the toes for the lower; if this rule is not followed, the parts below the bandage will swell.

3. Place a layer of cotton between opposed skin surfaces, such as the fingers and toes.

4. Hold the roller in the right hand when bandaging the left limb, and *vice versa.*

5. Place the outer surface of the bandage on the inner side of the extremity, and secure it by making a couple of circular turns.

6. Bandage evenly and neither too tight nor too loose. Leave the tip of the extremities exposed to observe the state of the circulation in the part. If the blood when pressed out beneath the nails does not promptly return, the bandage is too tight and may cause gangrene.

Roller Methods. Roller bandages may be applied by *circular turns, simple spirals, reversed spirals, figure-of-8, spica,* and *knotted turns.*

Circular turns and *rapid spirals* are used chiefly to hold dressings in place; the method of using them is clearly shown in Fig. 130. The *slow* *spiral* (Fig. 131) is used where a limb is nearly cylindrical in shape; each turn is parallel with the turn below, which it envelops for about one-third of its width. For a limb increasing in size like the leg or forearm, this bandage would not lie evenly, and it becomes necessary to resort to reverses.

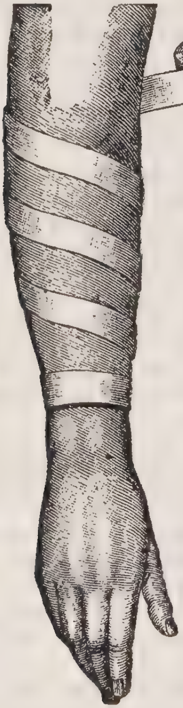


FIG. 130.—Rapid Spiral.

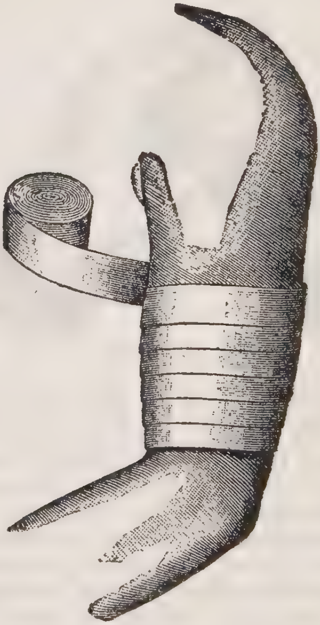


FIG. 131.—Slow Spiral.

The method of making *the reverse* is shown in Fig. 132; the bandage should be held loosely to give slack; the reverses should be in line and on the outside of the limb.

For covering the joints *the figure-of-*8 bandage becomes necessary; as the name implies, figures-of-8 are made in alternate loops above and below the joint; each loop covering in one-third of that immediately below (Fig. 133).

The *spica* is really a figure-of-8 with one loop much larger than the other, and is used especially at the hip and shoulder (Fig. 133).

The *knotted turn* is used where it is desired to make pressure, especially on the temple. Unroll about a foot of the bandage and hold it against the temple; then carry the roll around the forehead and occiput; on reaching the starting point, twist the roller around to a right angle and carry it down under the chin and over the vertex; then fasten the ends (Fig. 99).

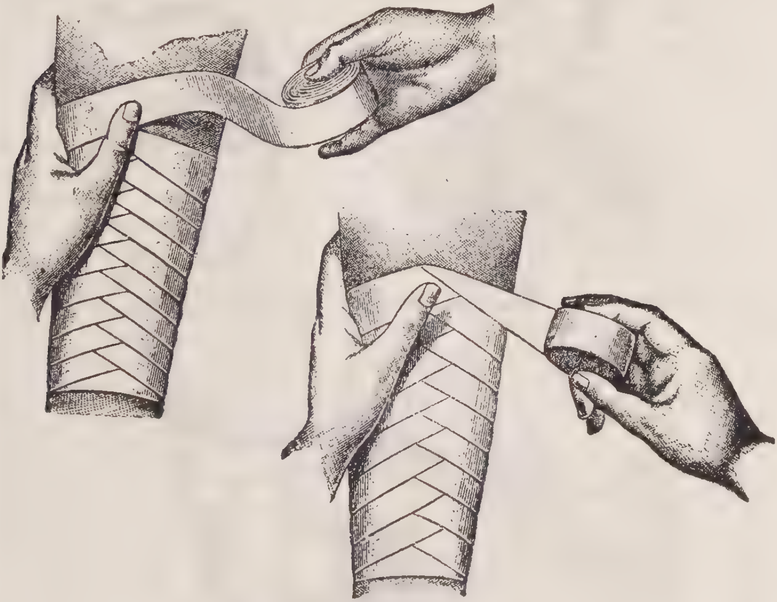


FIG. 132.—Steps in Making Spiral Reverses.

Special Applications of the Roller Bandage. *Recurrent of the head:* Make a couple of circular turns about the forehead and occiput; reverse in front and carry the roller back to the occiput over the middle of the vertex; reverse again and bring forward, covering in one-third of the preceding turn, continuing to carry the roller backward and forward until the head is well covered, when all the reverses are held in place by circular turns and pins, or sewing. Until the circular turns are made all the reverses must be held in place by an assistant (Fig. 134).

Recurrent of a stump: Made in the same manner as the recurrent of the head (Fig. 135).

Figure-of-8 of the eye: Place the end of the roller on the temple and make a couple of circular turns around the forehead and occiput, from right to left for the right eye, and *vice versa* for the left. Reaching the occiput, pass from under the right ear up over the right eye, across the opposite temple and down again to the occiput; make as many of these turns as necessary, and finally fix by circular turns (Fig. 136).

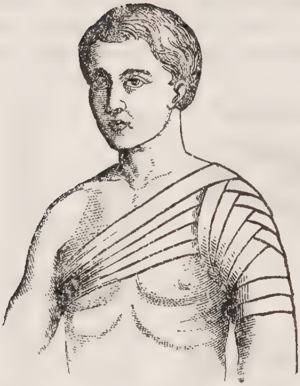


FIG. 133.—Figure-of-8, or Spica of the Shoulder.

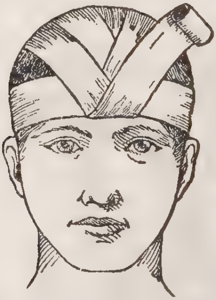


FIG. 134.—Recurrent of the Head.

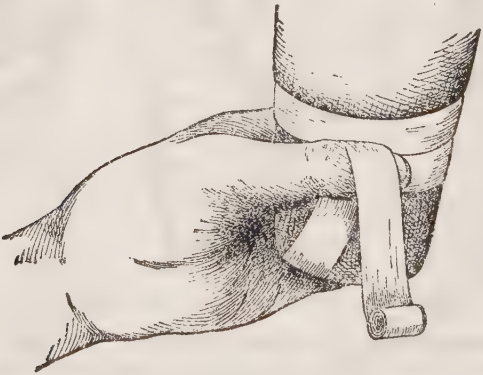


FIG. 135.—Recurrent of a Stump.

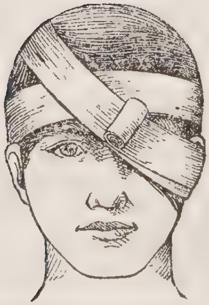


FIG. 136.—Figure-of-8 of One Eye.

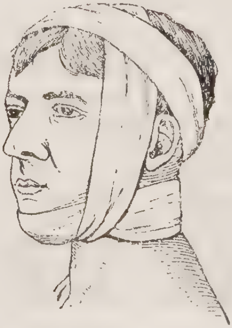


FIG. 137.—Figure-of-8 of the Jaw (Barton's Bandage).

Figure-of-8 of the jaw (*Barton's bandage*): Place the end of the roller below the occiput; pass obliquely up over the right parietal bone, across the vertex, down over the left temple in front of the ear, under the chin, up over the right temple in front of the ear, across the vertex, and back to the starting point. Then pass forward along the right side of the jaw in front of the chin and back along the left side of the jaw to the starting point. These turns may be repeated as often as necessary (Fig. 137).

Spiral of the chest: Unroll about five feet of the bandage; let the free end drop down over the front of the chest to about the knees of the patient, carry the roller over the opposite shoulder to the base of the chest, then around the chest over the loose end, ascending by a slow spiral. When the chest is bandaged as high as necessary fasten the last turn by a pin. Then bring up the loose end of the bandage over the other shoulder and down the back to the base of the chest and fasten to the lower and upper turns; this prevents the bandage from slipping down.

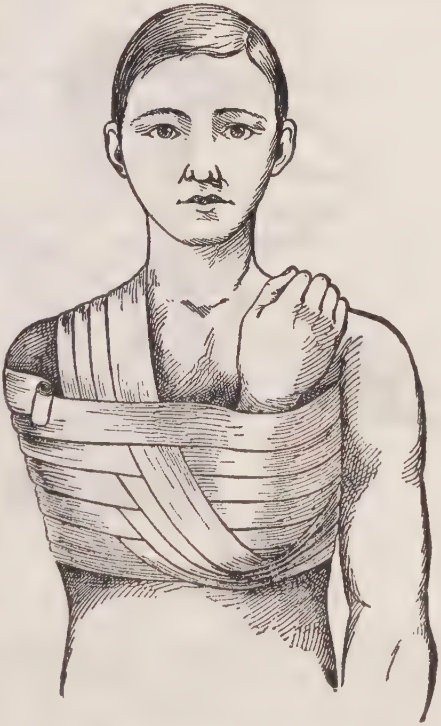


Fig. 138.—Velpeau of the Shoulder.

Velpeau (*for fractured clavicle*): Place the palm of the hand of the injured side on the sound shoulder, with padding between the arm and chest wall. Place the initial end of a roller in the axilla of the sound side, carry the bandage up across the back, over the shoulder of the injured side, down the *outside* of the arm, under the *outside* of the elbow, and across the front of the chest to the starting point; repeat this turn, but when the sound axilla is reached the second time make a circular turn around the chest and over the arm; then repeat the first and third turns alternately, each layer of bandage covering in about two-thirds of its predecessor. Stitch or pin the points of intersection of the turns (Fig. 138).

Scudder's modification of Velpeau: Commence in the axilla of the sound side as in the ordinary Velpeau, but carry the first and second turns horizontally around the front of the chest, the first under and the second over the elbow. The third turn ascends over the front of the chest to and over the injured shoulder, down the back of the arm, under the elbow and up again over the same shoulder thence across the back to the opposite axilla, and again horizontally around the chest, covering in one-third of the previous horizontal turn. The movements are repeated until the shoulder is reached (Fig. 139).

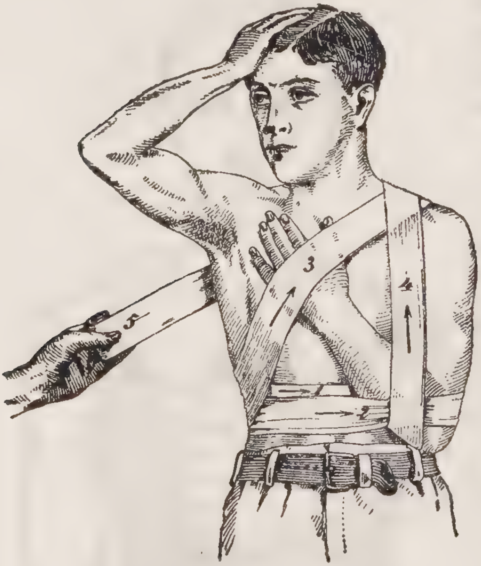


Fig. 139.—Modified Velpeau.

Finger bandage: Make two turns about the wrist, pass diagonally over the back of the hand to the root of the finger, descend by spiral turns to the tip, make a circular turn, then ascend by slow spirals or reverses; on again reaching the base of the finger cross the back of the hand to the wrist and finish with a circular turn about the latter (Fig. 140).

Foot bandage: Make a couple of circular turns around the ankle; descend obliquely over the dorsum, under the sole, and back to the dorsum of the foot, up which the bandage must pass by several spiral turns, covering the instep; when this is reached, pass the bandage under the point of the heel, thence to the dorsum, then down beneath the sole, then along the outer surface of the heel, next around the head above its point to reach the instep, whence, passing to the sole, a turn is made around and above the point of the heel on the inner side, again to pass the instep, when the roller must be carried by spiral and reversed turns up to the knee (Fig. 141).

Tailed Bandages. Bandages of various widths, split at each end, are called 4-tailed and are very useful about the head. The tailed principle (Fig. 95) present in our standard first-aid dressings expedites their application and promotes their apposition to a wound.

The T-bandage is especially useful in confining dressings to the perineum and pubic region; it is made by sewing a strip of bandage to the middle of another strip, the two forming a right angle.

Plaster-of-Paris and Other Special Bandages. *Gauze bandages,* sterilized, are usually employed in aseptic dressings.

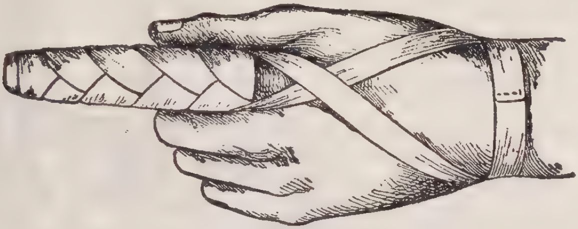


FIG. 140.—Finger Bandage.

Flannel bandages are used when it is desired to produce a moderate degree of elastic pressure, or where warmth is necessary. They lie more smoothly than non-elastic materials.

Rubber bandages are of special value when considerable pressure and support are necessary. They must be used with care and frequently adjusted and washed with soap and water. They are also employed like a tourniquet to control bleeding, and may be very quickly and effectually applied as follows: Make several circular turns about the limb above the bleeding artery, then lift up one of the turns and pass the unrolled part of the bandage under the turn and over the artery (Fig. 96).

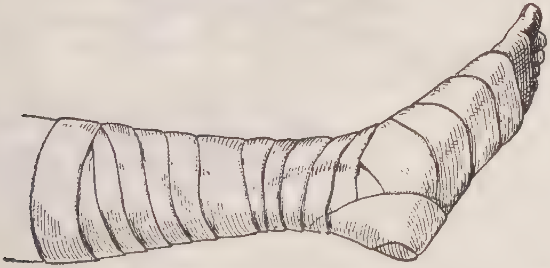


FIG. 141.—Foot Bandage.

Crinoline is used for fixed bandages, especially the *plaster-of-paris bandage;* gauze may also be used for this purpose, but a stiffer material is better. The bandages are prepared by placing on a paper a lot of freshly opened plaster and rubbing it into the meshes of the material with the hand while the bandage is being loosely rolled. When the bandages are not required for immediate use they should be wrapped

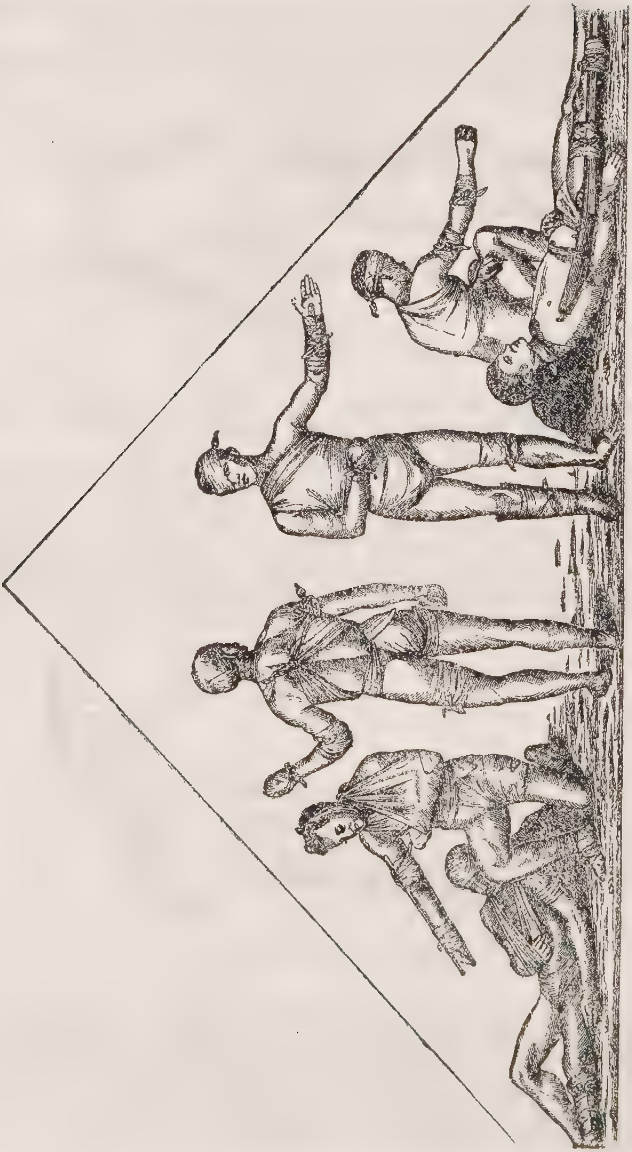


FIG. 142.—Triangular Bandage and its Uses.

separately in waxed paper and kept in a warm, dry place, preferably in tins. To apply, first cover the part with a flannel bandage or other protective, then place a plaster bandage, end down, in water sufficient to cover it; when bubbles cease to escape, squeeze the bandage gently and apply like any other bandage. Each time a bandage is taken out of the water place another in so as to have one always ready. Usually several thicknesses of bandage are required, especially over the joints; when necessary the dressing may also be stiffened by strips of tin incorporated in the bandage.

The floor should be protected by sheets or newspapers and the clothing of the patient and operator by the use of sheets.

The limb must be shaved, washed, dried, and powdered before the application of the bandage.

To remove plaster from the hands after completion of the operation, sugar or carbonate of soda should be added to the water, or, better, rubbed on the hands.

To remove plaster dressings when they are no longer necessary is an operation requiring patience and care. If the dressing is thin, plaster shears can be used, but if it is thick a strong knife or saw is necessary. The track of the knife or saw may be softened somewhat by dropping into it a little strong acetic acid or hydrochloric acid. The operation of removal is much facilitated if a strip of tin has been placed under the plaster, in the line of incision, while it was being applied; the strip may be cut down upon without fear of wounding the patient.

Triangular Bandage and Its Application (Fig. 142). In emergencies, a *triangular bandage* possesses special advantages, as it can be quickly improvised and easily applied and removed.

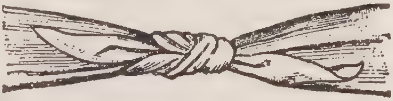


FIG. 143.—Reef Knot.

The triangles are made by taking a piece of cheese cloth, sheeting, or similar material 38 to 41 inches square and cutting it diagonally into halves (Fig. 142).

The bandage is used in three general forms: as an open triangle, folded twice from apex to base as a *broad cravat,* and folded three times as a *narrow cravat.*

To fasten the ends together the reef knot (Fig. 143) is used, which is much more secure than the "granny" (Fig. 144). (See also Chapter XVIII.)

Head: Place the base of the triangle just above the eyes and let the apex hang down over the occiput; cross the ends below the occiput, bring them to the front and tie; bring the apex up over the crossed ends and pin.

Eye: Use the narrow cravat, tying the ends behind.

Chin or side of head or face: Use the narrow cravat, tying under the chin or on top of the head. Or apply middle of handkerchief over front of chin and tie back of neck.

Neck: Use broad or narrow cravat. Place center of cravat over dressing, cross on opposite side and tie in front.

Chest: Apply the center of the open triangle over the dressing; tie the ends on the opposite side, leaving one end long; bring the apex over the shoulder and fasten to the long end. If the end is not long enough lengthen it by using a narrow cravat.

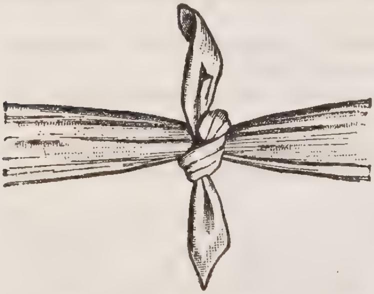


FIG. 144.—"Granny" Knot.

Pelvis: Apply the center of the base of the opened triangle just below the navel; carry the ends around to the back and tie one end long; bring the apex over the perineum and between the thighs to the rear and fasten to the long end.

Buttocks: Apply the base of the opened triangle to the lower part of the back; bring the ends around the sides, crossing them in front, and pin; split the apex and fasten in front.

Slings: The large arm sling is applied in three different ways. In the *first method* place one end of the triangle over the sound shoulder; the base should be in front and the apex in rear; bring up the front end over the shoulder of the injured side and tie on the side of the neck; bring the apex forward and pin (Fig. 145). When the collar bone is injured the *second form* is used; it is applied in the same manner as the first except that the front end is carried under the arm pit instead of over the shoulder of the injured side (Fig. 146). *In the third form* the rear end is carried over the shoulder of the injured side; otherwise it is the same as the second (Fig. 147). For the small sling the narrow cravat is used, carried over the shoulders and fastened behind (Fig. 148).

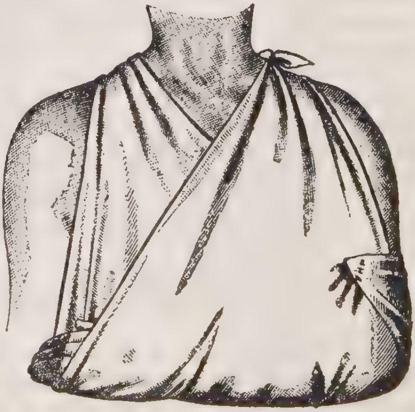


Fig. 145.—Large Sling No. 1.

Shoulder: Place the apex of the triangle on the shoulder; carry the ends around the arm, crossing them and tying at the outside; fold the apex over a sling or neck cravat and pin (Fig. 148).

Elbow: Use a broad cravat, as shown in Fig. 148, or a large arm sling. (Fig. 145).

Hand: Place the hand, palm up, on the triangle, ends of the fingers toward the apex; bring the apex up over the palm; pass the ends around the wrist over the apex, which is then folded toward the fingers and covered by another turn of the ends; tie the ends behind (Fig. 148).

Hip: Apply a narrow cravat around the waist. Carry the ends of the triangle, base down, around the thigh and fasten. Pass the apex under the cravat, fold over and tie. (Fig. 142.)

Knee: Use the broad cravat; cross behind the knot in front below the knee-cap; or *vice versa* (Fig. 149).

Foot: Place the foot on the triangle, toes toward the apex; bring the apex up over the toes toward the ankle; cross the ends over the front of the ankle and over the apex of the bandage, then carry them back around the ankle, crossing them behind in such a manner as to catch the base of the triangle; next draw up the apex so as to tighten the bandage and fold it over toward the toes. Bring the ends forward and, crossing over the ankle and apex, carry them beneath the foot and tie on the inside (Fig. 150).

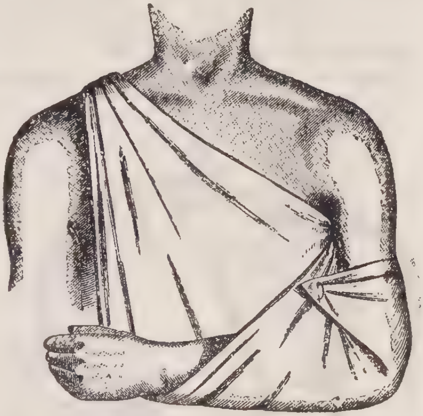


Fig. 146.—Large Sling No. 2.

To fasten splints: Take a narrow cravat, double it upon itself; place the loop on the outside of the limb; carry the free ends around the limb and one of them through the loop; then tighten as much as necessary and tie.

Infection and Disinfection. *Bacteria* are minute vegetable organisms, so small that they can not be seen except with a microscope, many of which grow on or in the human body and cause disease. The terms *microbes* and *germs* are ordinarily used in the same sense as bacteria.

An *infectious disease* is one which is capable of infecting other persons, causing the same disease in them; smallpox and malarial fever are both infectious. A *contagious disease* is that form of infectious disease which is spread to others by *contact* with the person infected. Smallpox is a contagious disease. Malarial fever is not a *contagious* disease because no amount of simple contact with an infected person can produce the disease, the infection of which must be carried by a mosquito.

In the military service we are gradually dropping these fine distinctions and simply characterizing as "communicable", all diseases which are transmissible. *Disinfection* is the process of destroying the infectious germ or agent to prevent the spread of the disease.

An infectious disease may be due to an animal or a vegetable organism; in either case the parasite is so small as to be visible only under the microscope or not visible at all.

Some of the diseases due to animal parasites are malaria, amoebic dysentery, and probably yellow fever and dengue.

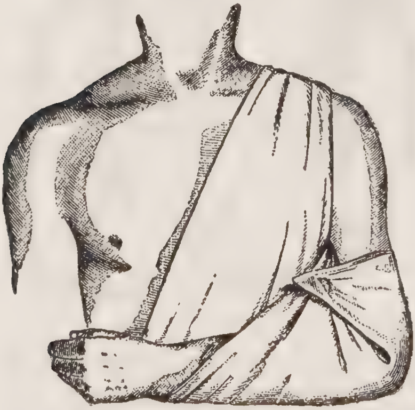


FIG. 147.—Large Sling No. 3.

Sepsis or putrefaction is a particular form of infection; *antiseptics* are those substances which prevent putrefaction either by destroying the germs, or preventing their growth.

Sterilization is the process of killing disease germs; it has the same meaning as disinfection, but is usually limited to disinfection by heat.

In all disinfection work it should be constantly borne in mind that *the agent employed must be used at the proper strength, for a definite length of time, and must be brought thoroughly in contact with all parts of the substance to be disinfected.*

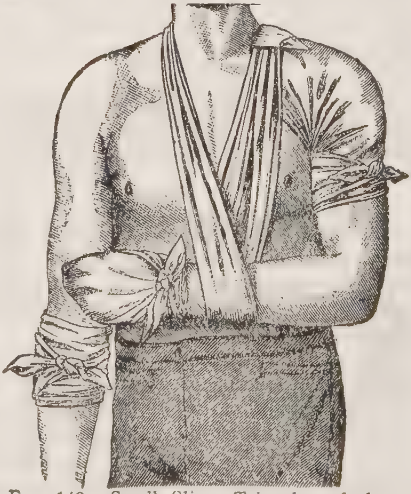


FIG. 148.—Small Sling, Triangles of the Hand, Elbow, and Shoulder.

Disinfectants. The *disinfectants* commonly used by the medical department in addition to direct sunlight, are dry heat, boiling water, steam, corrosive sublimate, phenol, cresol, iodine, quicklime, chlorinated lime, formaldehyde solution, and sulphur.

Dry heat is seldom used, as the high temperature necessary injures fabrics, and the heat has little penetrating power.

Flowing steam is used especially in the operating room for disinfecting dressings.

Boiling is a simple and effective method of disinfection for metallic or earthern utensils, and for cotton or linen fabrics. Woolen and leather substances are injured by steam or boiling water. The addition of one per cent of carbonate of soda increases the disinfecting power of the boiling water and prevents instruments from rusting. Actual boiling for ten minutes is ordinarily sufficient.

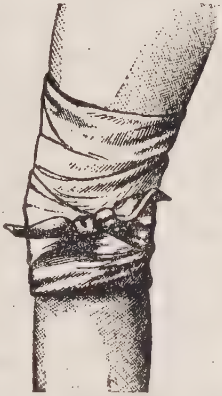


Fig. 149.—Broad Cravat of the Knee.

Corrosive sublimate in acid solution (0.2 per cent hydrochloric acid) is one of the most effective chemical disinfectants; for this purpose solutions of corrosive sublimate 1:1000 are usually employed. Its disadvantages are that it is decomposed by albuminous matters and by hard waters, and that it corrodes and rapidly destroys metals. Solutions should be freshly prepared, and in soft water, such as rain water or distilled water. When only hard water is available some other disinfectant should be used.

Phenol is a valuable disinfectant in five percent solution. It, like corrosive sublimate, coagulates albumin and thereby to some extent protects the inclosed germs from the disinfectant action.

Cresol in one per cent solution has about the same value as phenol at five per cent. Albuminous fluids do not interfere with its action.

Iodine in 3 to 5 per cent alcoholic solution is very valuable for disinfecting wounds, or sterilizing the skin before operation.

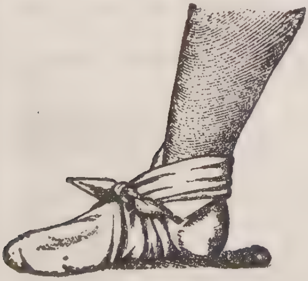


Fig. 150. — Triangular Bandage of the Foot.

Quicklime is a somewhat uncertain disinfectant because of the fact that it is rapidly decomposed on exposure to the air and moisture. Milk of lime, a ten per cent solution of quicklime, is ordinarily employed. To be effective the lime must have been freshly burned and be unslaked.

Chlorinated lime is used ordinarily in four per cent solution in water. Its activity depends on the amount of chlorine it contains, and, as it is rapidly changed on exposure to the air, it should have been freshly opened and prepared in order to be effective.

Generation of Formaldehyde Gas. *Formalin* is a solution of *formaldehyde gas* in water, its disinfecting powers depending on the dissolved gas. It is sometimes used in the form of a spray, but ordinarily the gas itself is employed.

The only apparatus required is a large open vessel, protected by some non-conductive material to prevent the loss of heat from within. An ordinary milk pail, set into a pulp or wooden bucket, will answer the purpose. In generating formaldehyde gas the following preparatory steps should be taken—

1. Have all windows and doors (except door of egress) tightly closed. Securely paste strips of paper over keyholes, over cracks, above and beneath and at sides of windows and doors, over stove holes and all openings in walls, ceiling and floor. If opening be large, paste several thicknesses of paper over opening. Carefully stop up the fireplace if there be one. There must be no opening through which gas can escape.

2. All articles in the room that can not be washed must be spread out on chairs or racks. Clothing, bed covers, etc., should be hung on lines stretched across the room. Mattresses should be opened and set on edge; window shades and curtains spread out at full length. If there is a trunk or chest in the room, open it but let nothing stay in it. Open the pillows so that the gas can reach the feathers. Do not pile articles together.

3. With the room thus prepared, as is essential in any form of gaseous disinfection, crystals of potassium permanganate (16 ounces to each 1,000 cubic feet of room space) are placed in the container. Over this is poured "formalin," or the 37½ per cent aqueous solution of formaldehyde (16 ounces to every 1,000 cubic feet of room space). The temperature of the room must not be below 60° F. The formaldehyde gas is promptly liberated by the vigorous reaction of the formalin and potassium permanganate, and arises from the generator in immense volume in the form of an inverted cone. *The permanganate must be put in before the formaldehyde solution.* It is consequently necessary that all preparations be made in advance, and that the operator leave the room at once on the combination of the two chemicals.

The door or window of exit must be promptly closed and sealed and the room left closed for at least four hours.

As in all methods of disinfection, success largely depends upon the care which is exercised and the attention which is given to every detail.

If a milk pail is used as a generator it should be so set as to fit snugly into a wooden or pulp bucket, or it may be wrapped tightly with several layers of asbestos paper. This is done to retain the heat within the generator and is very important to the proper generation of the gas.

Care must be taken not to place too much formaldehyde in a single container. The reaction is violent and there is great effervescence and bubbling. If the room is too large to be disinfected with one generator, use as many more as are required, and place in each only a reasonable amount.

The following quantities may be used safely in the containers recommended:

10 or 12 quart milk pail,	Formaldehyde, 16 ounces; Permanganate, 16 ounces.
14 quart milk pail,	Formaldehyde, 24 ounces; Permanganate, 24 ounces.

Generation of Sulphur Fumes. *Sulphur fumes* are valuable as a disinfectant chiefly because of their power of destroying animal carriers of infection such as mosquitoes, fleas, lice, and rats; they also have some value as destroyers of bacteria but they injure metals, fabrics, food-stuffs and colors.

Four pounds of rolled sulphur are required per 1,000 cubic feet of air space. The room must be tightly closed and all cracks and openings sealed; the sulphur broken in small pieces is placed in a pan and a small quantity of alcohol poured over it; the pan is then placed on bricks in a tub of water, the tub placed on a table, not on the floor, and the alcohol ignited. The water serves two purposes; it increases the efficiency of the sulphur dioxide by virtue of the vapor liberated by the heat of burning sulphur, and it also lessens the danger of fire (Fig. 151).

Sulphur candles can be used instead of crude sulphur, but care must be taken to use sufficient candles. The average candle on the market contains one pound of sulphur. Three of these will be required in the disinfection of a small room, 10 x 10 x 10. Do not use a less number, no matter what directions may accompany the candle. The water-jacketed candle is preferable. Partly fill tin around candle with water and place candles in a pan on the table, not on the floor. Let one-half pint of water be vaporized with each candle. In the absence of moisture, the fumes of sulphur have no disinfecting power. Keep the room closed for 10 hours at least.

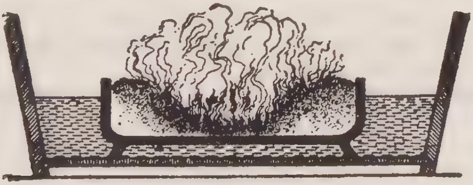


FIG. 151.—Burning Sulphur.

The *prevention of the spread of infectious diseases* requires absolute cleanliness, free ventilation, disinfection, and isolation, and in the case of diseases such as malaria, yellow fever, dengue, typhus fever, plague, etc., which are carried by insects, protection from the insect carriers. In the bacterial diseases the infectious agent is usually contained in one or more of the excretions of the patient, depending upon the particular disease. As the bacteria can not get into the air from moist excretions these should not be allowed to dry but should be disinfected and removed at once.

The dust of the ward becomes infected from excretory particles which have accidentally become dried; hence every care should be taken to avoid raising dust.

Flies and other insects may carry the infection on their feet or other parts of their bodies, therefore the discharges should be carefully protected from insects.

Sputum should be received in covered cups containing a one per cent solution of cresol, or five per cent formalin. Sometimes paper cups are used, the cups and contents being burned together.

Feces are best disinfected with milk of lime, ten per cent, or solution of chlorinated lime, four per cent.

Urine should be sterilized by adding sufficient carbolic acid to make a five per cent solution, or enough corrosive sublimate to make a solution of 1:1000.

In all cases the disinfectant solution employed should be equal in bulk to the material to be disinfected and should be thoroughly mixed with the excretion and allowed to stand at least an hour.

The vessels which have been used as containers should be boiled.

Infected clothing and bedding should be disinfected by steam, or formaldehyde gas in a tight chamber, but steam should not be used for woolens. If the infection is gross, as when the bed linen of a typhoid or cholera patient is soiled with feces, the articles should be soaked for several hours in a cold phenol or cresol solution containing two per cent of soft soap.

Boiling is applicable to linen or cotton fabrics.

Mattresses of which the hair is infected require steam under pressure, the ticking having been opened up.

Metal beds should be washed with five per cent solution of carbolic acid.

Disinfection of Rooms. The contents of the room should not be removed. Articles of bedding and clothing should be hung on lines or the backs of chairs so as to expose as much surface as possible. The room must then be made practically airtight by sealing windows, doors, ventilating openings, and all other cracks and openings with strips of paper and ordinary flour paste. Formaldehyde gas or other suitable gas is then introduced in proper proportion and the room kept sealed for twenty-four hours.

The latest investigations indicate that this preliminary fumigation is of little value and may be omitted; the mechanical cleansing is the important feature.

The treatment of the walls and ceiling will depend upon their nature; if hard-finished or painted they should be scrubbed with hot water and soap, and then with an acid solution of corrosive sublimate, 1:1000, and *repainted;* a preliminary scrubbing of the walls with slices of stale bread is very effective for mechanical cleansing; bread so used should be burned. If the walls are calcimined or whitewashed they should be washed with soap and hot water, followed by ten per cent solution of chlorinated lime or five per cent of phenol, and *recalcimined;* sublimate should not be used because it is decomposed by the lime. If the walls are papered the paper should be removed, after which the treatment is the same as for calcimined walls. Especial attention should be given to the lower parts of the walls, the first six feet from the floor.

All woodwork is to be scrubbed with soap and hot water, followed by corrosive sublimate; painted or varnished woodwork should be repainted or varnished. Floors with hard finish should have the old finish removed with turpentine and a new coat applied.

After the completion of the disinfection the room with all doors and windows open should be freely exposed to the action of sun and air for several days.

Disinfection of Tentage. Everything should be removed from the tent for disinfection by the methods appropriate to each. The interior of the canvas, the poles, and the wooden floors, if any, should then be sprayed or washed with a one per cent solution of cresol or five per cent phenol. The tent is then removed to a new site, pitched inside out and exposed to the sun and air for twenty-four hours. The ground under the old tent floor should be policed and scraped, and sprinkled with a ten per cent solution of chlorinated lime, or freshly slacked quicklime.

The Operating Room and Surgical Nursing. In discussing infection and disinfection we spoke of bacteria in relation to disease; here we must consider them with special reference to surgical infections.

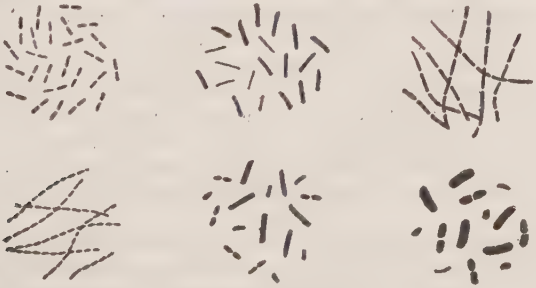


Fig. 152.—Various Types of Bacilli.

Bacteria may be divided into two general classes, *bacilli* or *rods,* (Fig. 152), and *micrococci* or *spherical bacteria* (Fig. 153); it is these latter that are especially concerned in wound infections. Micrococci may also be divided into two classes; those which are arranged in chains, *streptococci;* and those grouped in clusters like grapes, called *staphylococci,* the latter are concerned in ordinary suppurations such as boils and abscesses, while the former are the active agents in septicemia and erysipelas.

Some bacteria produce *spores* or seed which are much harder to kill than the bacteria themselves.

Surgical Infections. We have already seen that *sepsis* means *putrefaction;* an *aseptic* wound is one that is *surgically clean,* that is, free from all germs; antiseptics prevent putrefaction by destroying the germs or preventing their development. A wound offers just the conditions necessary for the growth of bacteria—heat, moisture, and abundance of nutritive material, and the bacteria are everywhere present, on the skin, on the clothes, instruments, and fingers, and in the air, so that if we are to avoid infection minute care is necessary. All disease germs in the process of their growth produce certain poisons, the nature and action of which vary with the particular germ. Yeast, which is really a mass of germs, in its growth in sugar solution produces alcohol, which when absorbed causes intoxication and, if in excessive amounts, death. The nux-vomica plant in its growth produces strychnine, one of the most powerful of all poisons. So with disease germs. The staphylococci in a wound cause inflammation and suppuration; if the poison is absorbed fever results, *toxemia* or *blood poisoning.* Streptococci have the same effect, and in addition frequently invade the blood themselves and grow there, producing *septicemia, pyemia,* and death. Staphylococci may also invade the blood stream but with less fatal consequences.

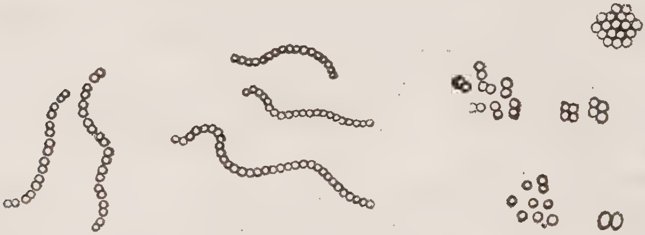


Fig. 153.—Streptococci and Staphylococci.

Pyemia differs from septicemia only in that abscesses form at a distance from the original infection, especially in the joints, muscles, and lungs; the abscesses are caused by the pus cocci which reach those points through the blood.

The most important point in surgical nursing is absolute cleanliness on the part of the nurse; a nurse with dirty hands and finger-nails is an abomination and should not be tolerated for a moment. It should be borne in mind that surgical infections are readily carried from one patient to another, and thorough cleansing and disinfection of the hands and the wearing of sterile rubber gloves before dressing each case should be the rule.

Preparation of Patient. The *preparation of a patient for a major operation* usually begins the night before, when a laxative is given followed by an enema early in the morning of the operation.

About twelve hours before the operation the field of operation and the surrounding skin are shaved and then washed with hot water and soap; about six hours before the operation the skin is wiped dry with a sterile towel and then moistened with tincture of iodine, and covered with dry sterile gauze.

If the operation is done in the morning no food is given after the light supper of the previous night. The urine is passed or drawn the last thing before going to the operating room; at the same time any false teeth are removed.

Just before the operation a second application of iodine is usually made. The iodine is applied with a sterile swab. Some surgeons paint the operative field with iodine, followed by a liberal swabbing with 95% alcohol. All iodine should be removed.

In emergency operations the washing is omitted and the shaving done without soap because the iodine penetrates the skin better if it is perfectly dry.

After Care of Patient. While the operation is being done the bed has been prepared in the prescribed manner; when the patient is in bed a nurse is detailed to remain by him until the effects of the anesthetic have passed off. This is necessary, as in his unconscious condition he may fall out of the bed, tear off his dressings, get up, or choke while vomiting, and be unable to help himself. Sometimes the patient may be in a condition of extreme shock, with cold, clammy skin, shallow breathing, and weak rapid pulse; in such a case hot-water bottles should be freely used, stimulants given by means of a "shock enema" or hypodermic medication, and the foot of the bed raised. After shock the next dangers to be looked for are hemorrhage and infection. Infection usually first manifests itself by rise of temperature and chilly sensations; even aseptic cases, however, often have a temperature of about 100° F. for the first day or two, constituting what is known as *surgical fever*. In aseptic cases there is little for the nurse to do beyond the administration of diets. All wounds are usually examined by the surgeon within 48 hours of operation.

In surgical rounds the duty of the nurse is to have everything ready for any necessary *change of dressings*. The patient should be catheterized, if necessary. Dressings may be done in the ward, or there may be a special dressing room to which the patients are taken on a litter. In the former case a movable dressing table or ward carriage is usually employed. Besides a liberal supply of sterilized dressings in glass jars there will be required bandages, safety pins, an irrigator, antiseptic and sterile normal saline solutions, scissors, dressing forceps, dissecting forceps, basins, a covered pail or paper bags for the soiled dressings, hot and cold water, soap, hand brushes, towels, and rubber sheeting.

Dressings are of two general types, *dry dressings* and *wet dressings;* the former are almost invariably used in aseptic wounds and consist of a pad of sterile gauze about half an inch thick, covered with a layer of absorbent cotton. *Wet dressings* are used in infected wounds and consist of a pad or wicks of sterile gauze usually kept moist with a solution containing chlorine after a method known as the Carrel-Dakin. Antiseptics are used in wet dressings because we wish to destroy the germs which we know are already present, and the whole dressing is covered by a *protective,* sometimes oil silk, because we wish to keep the dressing moist and so allow a more uniform diffusion of the discharges which always occur in infected wounds.

The Operating Room. The attendant in charge of the operating room must have a clear understanding of the technique of aseptic operating and must be a man of great carefulness and conscientious in details. He must remember always that surgical infections usually come from contact with something not surgically clean, and not from the air. The room itself must be clean and free from dust; it must be disinfected at frequent intervals and no dusting must ever be permitted there; instead the floors must be mopped and the walls wiped with cloths moistened with an antiseptic solution. The temperature of the room should be about 72° F.; 80° F. in abdominal operations.

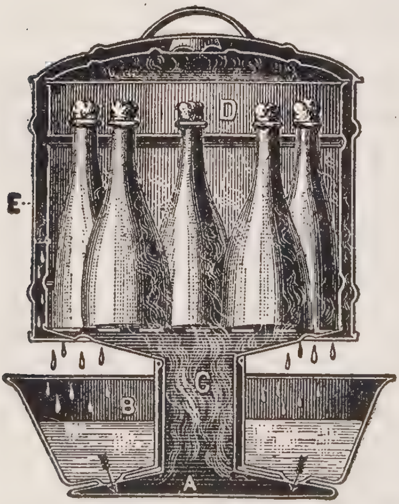


Fig. 154.—Arnold Sterilizer.

Sterilizers: There are two general types of sterilizers in use, the essential difference being that in one steam is used under pressure, and in the other the steam is flowing. Of the latter kind of sterilizer, the Arnold (Fig. 154) is a type. In hospitals, steam under pressure is always used.

The steam pressure sterilizer is known as an *autoclave.* It consists essentially of a metal cylinder with a tight fitting door, and provided with a steam pressure gauge, safety valve, air vent, thermometer, and apertures for the entrance of steam.

Outside the cylinder is a steam jacket, with a space between it and the cylinder, in which the steam circulates.

In sterilizing dressings, a pressure of fifteen pounds of steam for twenty minutes is usually employed.

If glassware is used in the sterilizer, it is necessary to put a folded towel, or something of that nature, between the glass and the metal, to prevent breakage, and if liquids are contained in the glass, the door of the chamber should not be opened until the pressure within is reduced to normal, otherwise the liquid may boil over or the stopper may be blown out.

The operating table is prepared by covering it with a folded blanket, over which is placed a rubber sheet and over that a sterilized sheet, or a Kelly pad or surgical cushion may be used. On a small table by the head of the operating table are placed the appliances used in anesthesia.

Instruments are usually sterilized by boiling from two to five minutes in one-per-cent solution of soda, the soda being used to prevent rusting. As boiling dulls sharp instruments, these may be better sterilized by soaking in 95 per cent alcohol for half an hour.

Aluminum instruments are ruined by soda solution; they must be boiled in plain water.

Instrument trays, basins and pitchers, and rubber irrigators are boiled five minutes in plain water.

Dressings cut in proper sizes, bandages and gauze, sponges, towels, sheets, and operating gowns are wrapped in towels or sheets pinned in small packages, and sterilized twenty minutes under fifteen pound steam pressure. Besides the dry sterilized towels a number of damp towels sterilized by boiling should be ready to surround the field of operation and for other purposes.

Gauze sponges are prepared of four or five thicknesses of gauze, about six inches square, with the end sides folded in or stitched so that there will be no loose threads to be left in the wound.

Laparotomy pads are usually of several thicknesses, with the edges turned over and sewed, and with a tape fastened to one corner.

Gauze for packing is cut in long narrow strips, folded inward several times from the edges, and the strips then packed in glass tubes closed with cotton, before being sterilized.

In many hospitals gauze which has been used, except in septic cases, is used over again after preparation as follows: Soak for several hours in cold water, with frequent stirring. Wash clean, under a running stream of tepid water. Boil for half an hour. Wring out dry, and then proceed as with new gauze.

Iodoform gauze is frequently used, especially for packing suppurating wounds or abscess cavities; it is prepared as follows: Sterilize five yards of gauze; mix ten ounces of glycerin with an equal amount of water and boil fifteen minutes; add a half-ounce of iodoform to three ounces of alcohol and mix with the water and glycerin; then, while stirring briskly, immerse the gauze in the mixture; wring out and keep moist in a closed glass jar.

The *sutures* and *ligatures* ordinarily used are catgut, silk, and silkworm gut; the two last named are sterilized by simple boiling in plain water.

Catgut is not made from the gut of a cat, but from that of the sheep; being animal in nature it requires thorough sterilization, but will not stand boiling in water. Catgut in the army medical service is usually issued already sterilized, but some surgeons prefer not to rely on trade processes, and prepare their own animal sutures. There are many different methods employed; nearly all include as the first step the removal of the fat from the catgut by soaking forty-eight hours in ether, which is changed daily.

Among the methods are boiling in alcohol, the iodine method, and the cumol method.

The iodine method is satisfactory and simple. The catgut without previous preparation is wound on glass spools in one layer and placed in a one-per-cent solution of iodine and iodide of potash in distilled water for one week; the spools are then withdrawn and kept in alcohol.

To boil in alcohol wind the catgut on clean glass spools, soak in ether for twenty-four hours to remove grease, shaking several times during the period; remove from the ether and soak twenty-four hours in alcoholic solution of corrosive sublimate 1:500; remove from sublimate solution and boil in 95 per cent alcohol over a water bath for ten minutes. Keep in same jar until required for use.

Metal and glass syringes with rubber or asbestos packing may be boiled; if the packings are leather draw boiling water into the syringe, immediately force it out, wash out several times with five per cent phenol, and soak in the same solution while full; the needles are boiled with the wires in place.

Rubber goods: Vulcanized rubber may be boiled for one minute; fountain and bulb syringes, drainage tubing, rubber bandages, rubber gloves and finger cots, soft-rubber catheters and bougies, may be boiled five minutes in plain water.

Hard rubber is spoiled by boiling; soak in five per cent phenol. Rubber tissue (gutta-percha) will not stand boiling; wash in cold water with green soap, rinse, immerse twenty-four hours in solution of corrosive sublimate 1:1000.

Web catheters and bougies will not stand heat; disinfect in an antiseptic solution.

Normal saline solution may be necessary. It is a 0.9 per cent solution of sodium chloride (common salt) in water. It is called "normal" because it has the same specific gravity as blood serum, which fact renders it less irritating than plain water. It is prepared by dissolving nine grammes of salt in a liter of boiling water and sterilizing in a glass flask, which is exposed to flowing steam in a steam sterilizer for a half hour at a time on three successive days. This method of fractional sterilization is more successful than a single sterilization for an hour and a half because, while a single exposure of half an hour will kill all the adult bacteria, the *spores* or *seeds* are more resistant; the intervals of twenty-four hours allow the development of the spores which are then killed by the next sterilization. The mouth of the flask is closed with nonabsorbent cotton which is drawn over the lip of the flask and held in place by a piece of gauze. In the absence of normal saline tablets or exact means of measurement, the proper amount of salt may be approximated by using a scant teaspoonful to a pint of water. In emergency the water is simply boiled five minutes instead of being subjected to fractional sterilization. When used for intravenous or subcutaneous infusion the solution should be filtered just before use.

Drainage may be tubular or capillary; for the former, rubber or glass drainage tubes are employed. Rubber drains are prepared for use by washing with soap and water, rinsing, boiling five minutes, and keeping in a three-per-cent solution of phenol frequently changed. Glass drains are boiled. For capillary drainage we use strips of gauze about an inch wide and free from any loose threads, or a few strands of silkworm gut may be employed.

The most important part of the whole preparation is the *disinfection of the hands and forearms* of the operator and his assistants. Many different methods have been recommended for this purpose, and, while none are capable of making the hands germ free, most of them give satisfactory results. In all the methods there are two steps; first, mechanical cleaning; second, chemical sterilization; the first is by far the most important.

An excellent method of mechanical cleansing is as follows: After trimming the nails remove all dirt from beneath them with a nail cleaner; wash in running hot water and thoroughly scrub for five minutes with a stiff brush recently boiled; pay especial attention to the edges of the nails; again clean the nails with a sterile cleaner, rinse the hands in boiled water, paint hands with 3½% iodine solution to above the wrist line, and then immerse in alcohol, 95%, until the iodine has disappeared.

Most surgeons prefer to use dry sterilized rubber gloves, but even with the gloves sterilization must be done just as thoroughly, as gloves are often punctured or leaky.

The field of operation is prepared by painting it with tincture of iodine; as soon as dry this is removed with 95% alcohol; only so much of the surface as is necessary is exposed, all the rest of the body being protected by a blanket covered with sterile sheets; immediately around the operating field sterile towels may be used.

The sterilization of the hands is usually done before the operating gowns or suits are put on, and once done nothing should be touched which is not sterile; this is the rule which is most frequently broken by the inexperienced nurse; in his hurry or excitement he picks up something which is not sterile and then he must disinfect his hands again, or change his gloves if he is wearing such covering.

Frequently during the operation the surgeon will wish to wash his hands to remove blood, so that a basin of sterile water must be kept ready at hand.

Sponges, compresses, pads, etc., used in and about wounds, especially in laparotomies, must be counted and accounted for before the opening is closed.

After the operation the room must be immediately cleaned. All unused animal sutures which have been handled should be thrown away; soiled or bloody towels, sheets, etc., placed to soak in cold water; and the instruments cleaned, counted, and put away.

To clean the instruments they are taken apart and washed in cold water to remove the blood, paying special attention to serrated parts, they are then washed in hot water and soft soap, rinsed, and thoroughly dried. Instruments which have been used in an infectious case must be sterilized before being cleaned. *Scalpels* and other cutting instruments must be cleaned separately, taking particular care not to dull the cutting edge. Needles should be cleaned with sand-soap, put in alcohol, and then dried and inserted through gauze strips for safe-keeping.

Artery forceps which take apart usually have the same number stamped on the corresponding blades; if they do not, they should be cleaned one by one, so as not to get them mixed. Locks, screws, holes, and depressions must be carefully cleaned and dried with wisps of absorbent cotton.

Rouge and putz-pomade may be used to remove rust and stain.

The leather packing and washers of *syringes* must be kept moist by frequent use of water or glycerin, and such syringes should always be tested before use to see that they are in working order.

Fountain syringes after washing should be hung bottom up to dry, after which their mouths should be plugged with cotton to exclude dust.

Rubber catheters after drying are to be kept in talcum.

Rubber bandages in like manner are to be dusted with talcum and rolled up, tapes, if any, inside; they must be protected from the air by inclosure in a tin box with the top secured with a strip of adhesive plaster.

Rubber gloves should be thoroughly dried with a towel, dusted with talcum inside and out, and protected from the air in tin boxes. Punctures may be closed with rubber cement, or patched with a piece of an old glove by the aid of the cement.

Field Expedients. *In the field* many of the conveniences of the operating room in the fixed hospital are absent, yet very excellent results may be obtained. The work may be done in a tent, or even with no more shelter than a fly; under such circumstances dust is one of the greatest dangers to be guarded against. If possible no movement of troops or vehicles should be allowed in the immediate vicinity; the floor of the tent and the grounds around it should be thoroughly sprinkled to lay the dust, and wet sheets may be hung so to afford further protection to the wounds. All troops are supplied with adequate equipment for emergency operations but even in the absence of this equipment operations may still be performed by resorting to expedients such as follows. If no soda is available to boil the instruments, wood ashes may be used, tied up in a bag to avoid clouding the water; when steam sterilizers cannot be had the dressings may be boiled, or, in the absence of fire, saturated with antiseptics. When the water is very hard, muddy, or full of organic matter, bichloride of mercury is so rapidly decomposed that it should not be relied upon as an antiseptic; phenol should be used instead. If there are no receptacles large enough to boil the trays they should be scalded with boiling water, and strong antiseptic solutions allowed to stand in them for a half-hour before use.

In the absence of other suture material *horsehair* answers very well; it may be rendered aseptic by washing with soft soap and water, boiling ten minutes in 0.25 per cent solution of soda and then ten minutes more in plain water, after which it is kept in a 1:1000 alcoholic solution of corrosive sublimate.

Nursing in Communicable Diseases. It is important that nurses should know something of the most common communicable diseases, especially how they are transmitted from person to person (see Chapter XIII), the particular symptoms and special dangers of each, and how they affect the character of the nursing.

We have already defined infectious or communicable diseases as those which may be transmitted to others; it is the business of the nurse to prevent such transmission.

It should be remembered that *contact* is the great source of infection in medical cases, just as it is in surgical cases, and therefore *medical asepsis* should be observed.

All utensils and appliances used about the patient should be for his exclusive use, and kept within the room or barrier; nothing should be taken out of the room unless it be immediately sterilized; the nurse should wear rubber gloves when handling the patient, or wash and sterilize his hands immediately thereafter, and should put on a special gown, to be kept in the room, whenever he comes in contact with the patient or his bed. In addition to the customary gown all those in attendance on cases of cerebrospinal meningitis, diphtheria, measles, influenza, pneumonia, scarlet fever, or pneumonic plague wear an operating cap and a gauze face mask while in the wards or rooms where such patients are being treated.

Patients must be isolated individually or in groups, according to the disease from which they are suffering. We do not mix communicable diseases.

Vaccines and Antitoxins. *Vaccines* usually contain the dead or weakened germs of the disease against which they are used, while *serums* and *antitoxins* contain the natural antidotes for the poison created by their germs. Both vaccines and antitoxins are used as well to cure diseases as to prevent them.

The most common vaccines are those of smallpox, typhoid and paratyphoid, cholera, and plague, while the most common antitoxins are those of diphtheria, tetanus, and plague.

Vaccination Against Typhoid and Paratyphoid Fever. The site of the inoculation is the arm at the insertion of the deltoid muscle. If for any reason this site can not be used, the needle may be introduced in the back, over the lower portion of the scapula, or in the chest below the clavicle. The dose is to be given *subcutaneously* and not into the muscles nor into the skin. The arm should be cleansed as for any other operation. Tincture of iodine painted over the dry skin, before and after the injection, has proven satisfactory.

The ampule should be thoroughly shaken, washed off in an antiseptic solution, and opened after making one or more cuts near the top with a file. The vaccine can be drawn out of the container with a syringe, or it may be emptied into a shallow glass dish, such as a salt celler, which has been sterilized by boiling.

The syringe and needle should be sterilized by boiling in two-percent soda solution. To insure perfect sterilization, draw the piston out to its full length, or remove it entirely, so that the barrel is full of water during the boiling. A fresh needle should be used for each man, or, if one needle must be used on two or more men, it should be resterilized before each injection.

Vaccination against Smallpox. Men are usually vaccinated on the left arm, about the insertion of the Deltoid muscle. For aesthetic reasons women sometimes prefer to be vaccinated on the thigh or leg. There is no objection to such site. The skin at the site selected for the vaccination must be cleansed by the gentle application of warm water and soap. When clean, the site should be disinfected with acetone or alcohol, preferably the former, applied on sterile gauze or cotton, after which the site is allowed to dry. The skin at the point to be inoculated is then drawn taut and with the point of a sterile needle two small linear incisions approximately ¼ inch long and 1 inch apart are made. The scarification must penetrate the skin but should not be deep enough to draw blood. For purposes of future comparison as regards reaction, what is known as a *control incision* is then made in the skin at least 1 inch above the site for inoculation.

The smallpox vaccine is then applied directly to the two linear incisions and gently rubbed in for at least 15 seconds, using a sterile needle for the purpose. When the vaccine has thoroughly dried, it is covered with a thin dressing of sterile gauze, held in place by two narrow strips of adhesive plaster. An occlusive dressing should not be applied and the use of vaccination *shields* is prohibited.

Precautions in Certain Diseases. Among the more common communicable diseases are gonorrhea, chancroid, syphilis, typhoid fever, malaria, dengue, yellow fever, cerebrospinal meningitis, dysentery, cholera, diphtheria, tuberculosis, influenza, tonsillitis, mumps, erysipelas, and wound infections.

Typhoid fever: This disease is due to infection with the typhoid bacillus, which always gains entrance to the body through the mouth, and escapes from the body of the typhoid patient in the stools and urine and occasionally in the sputum. The germs are usually swallowed in infected water or food, but may get into the mouth indirectly as when one has been handling infected clothes, bedding, or other articles, and then handles food without washing the hands. The urine of the typhoid patient often contains typhoid germs for weeks after the patient is convalescent, hence the danger of urinating on the ground, where the germs thrive and, getting on the shoes of the soldier, are carried into barracks.

The initial lesion of typhoid fever is usually ulceration of the lower end of the small intestine, and this ulceration causes diarrhea and may go deep enough to cause hemorrhage or even perforation of the bowel. Sudden collapse in the course of typhoid fever is usually caused by either perforation or hemorrhage.

The fever ordinarily lasts about four weeks.

For his own protection the nurse, if not previously inoculated, should submit himself to prophylactic vaccination against typhoid and in addition must be careful to thoroughly wash and disinfect his hands every time after handling his patient, and again before eating. For the protection of others he must disinfect immediately all urine and stools, and everything which may have been soiled by them, such as bedding, towels, nightclothes, etc. Even the water which has been used in bathing the patient must be regarded as infected; it should never be emptied on the ground, but into a sink which is afterward flushed with a disinfectant solution.

Separate thermometers, feeding cups, etc., must always be used, but if this is not practicable they must be disinfected before use by other patients.

As flies carry the disease germs on their feet they must not be allowed to reach the patient or his discharges. Clothing and bedding must be disinfected.

Happily, as the result of universal inoculation among military personnel, typhoid and the para-typhoid fevers have become rarities in the army.

Dysentery: This occurs in two principal forms, amebic or tropical dysentery, and bacillary or epidemic dysentery. In both forms the germs are swallowed with water or food, chiefly the former, and in both they are thrown off in the stools.

The disease is therefore spread much like typhoid fever, and the precautions to be taken are practically the same, except that the urine in dysentery is not infectious.

Cholera: This disease is spread in the same way as dysentery, but is of short duration and very fatal. The only safety lies in eating and drinking nothing which has not been recently cooked.

Clothing and bedding must be disinfected, and also of course the stools and vomited matter.

Malaria: In this disease the infection is in the blood and cannot be carried from one person to another except by mosquitoes (the *anopheles*), which, after biting the malarial patient, then bite a person hitherto well. Therefore, the sick must be protected against mosquitoes, so that the mosquitoes can not get the disease, and the well must be also protected, so that if there are any infected mosquitoes about they may not do any harm. In mosquito regions be sure that no exposed part of the patient's body comes in contact with the net while he is sleeping. Mosquitoes can feed through the meshes of a net.

Dengue: The infection is carried by mosquitoes. Exclude them by screening the patient and the room in which he is isolated.

Yellow fever: This disease resembles malaria in that the infection is in the blood, and can only be carried by the mosquito (*Aëdes* (*Stegomyia*) *aegypti*); the precautions to be taken are the same. It is, however, a much more serious malady than malaria, and usually of much shorter duration. A curious feature of the disease is that it is not infectious, that is, cannot infect the mosquito, after the end of the third day; but the mosquito once infected is capable of carrying the disease to man probably as long as she (the mosquito) lives.

Cerebrospinal meningitis: In this disease it is believed that the infective germ usually gains access to the body through the throat and nose and is frequently received from meningococcus carriers, or persons who have been in contact with other cases, or themselves recently had the disease and still carry the coccus in their throats. This being the case, it is necessary to carefully disinfect all discharges from the throat and nose of the patient and also that the nurses and physicians who come in contact with cases of this disease should frequently spray their own throats and noses with an antiseptic solution. Inasmuch as we do not know just how contagious the disease is, nor in what excretions the meningococci leave the bodies of the sick, all cases and their attendants must be carefully isolated, and all discharges from the patient and everything which has come in contact with him, including the room in which treated and its contents, must be thoroughly disinfected.

Gonorrhea or *clap:* There is no danger of contracting this disease in its ordinary form except through sexual intercourse, but there is danger of getting some of the pus into the eyes and thereby inducing a very serious inflammation which often completely destroys vision. This may happen to the patient himself by bringing the unwashed hands, after handling the penis, in contact with the eyes, or more commonly to the nurse or other innocent person, from use of a towel on which the gonorrhea patient has managed to get some of the pus from his penis. Such a patient should be cautioned about the danger to his own eyes, and should not be allowed to use any toilet articles except his own.

Chancroid: While this disease is nearly always venereal, a nurse with a hang-nail or other abrasion may inoculate himself while dressing the sore or the resulting bubo.

Syphilis: Syphilis, though very communicable at certain times and under certain conditions, is not always so. The chancre, mucous patches, condylomata, and the blood during the first few years of the disease, are all contagious. The mucous patches, being often located in the mouth and throat where they are not visible, are especially dangerous. All the table ware, toilet articles, instruments and appliances, and bed linen used by syphilitics should be kept entirely separate from those used by others, and should be frequently disinfected. Should the nurse have any cut or abrasion on his hands he must be exceedingly careful in handling the syphilitic lesions, or the dressings which have been used on them.

Pulmonary tuberculosis: In this disease the infection is contained in the sputum. As long as the sputum is moist the germs can not escape into the air, but they may be carried by flies which alight upon it or in the fine spray which is thrown out when the patient coughs. The danger is in the dry sputum, which becomes pulverized and mixed with dust; hence it must be kept moist and always received in a disinfectant solution. If paper spit cups are used, these with their contents are burned. Clothing and bedding must be disinfected.

Pneumonia, like tuberculosis, is infectious through sputum which must be treated in the same way as that of the latter disease. Clothing and bedding must be disinfected.

Influenza; or *"the Grip":* In this disease the sputum is infectious and also the nasal discharge when there is any. The sputum is to be treated like that of pneumonia and tuberculosis, the nasal discharges are to be received on small pieces of gauze or toilet paper and immediately burned. Clothing and bedding must be disinfected.

In follicular tonsillitis the discharges from the nose and throat are infectious and should be handled in the same way as those of influenza.

The same remark applies to diphtheria, but this disease is very contagious through particles of the membrane which is present in the throat and often in the nose, and may be coughed into the face of the attendant; minute portions of the membrane lodged in the eye, nose, or mouth of the attendant may reproduce the disease in him. Patients with diphtheria should always be isolated. Clothing and bedding must be disinfected. Nurses not immune as determined by the simple *"Schick"* test, should be immunized by the administration of antitoxin before taking charge of the case.

Measles belongs to the class of *eruptive fevers,* which includes also *scarlet fever, smallpox,* and *chicken pox,* all of which are contagious, the infectious agent being inhaled or swallowed. Though there is reason to believe that they are all germ diseases, the supposition has not been proven for any of them. The discharges from the throat and nose are highly infectious, as are also the skin lesions in smallpox. The modern belief is that this class of diseases, like erysipelas and other wound infections, is spread chiefly if not entirely by persons or things which have been in contact with other cases. The general rules for nursing infectious diseases are to be followed and all discharges disinfected. Before the convalescent is allowed to mix with well people he should be given an antiseptic bath, 1:2000 bichloride, and the hair and scalp thoroughly shampooed.

Mumps: In *mumps* the causative agent is probably in the secretions of the mouth and throat. The disease is to be handled like eruptive fevers.

Erysipelas may be carried from one wound to another on the hands of the nurse, on instruments, dressings, etc., and possibly also through the air. So very contagious is it that an erysipelas patient should be isolated and his nurse should not go near any one with a wound.

Wound infections are readily carried from one patient to another in the same way as erysipelas is transmitted. A nurse who dresses infected wounds should not attend those whose wounds are aseptic.

As medical soldiers serving in the tropics occasionally have to nurse cases of *plague*, it is necessary that they should know something of that disease.

The most prominent symptoms of plague are great prostration, high fever, and the development of buboes, most commonly in the groin; but buboes are not always present. The disease is due to a bacillus which is found in the blood and all the discharges, including the pus from the buboes, the urine, feces, sputum, etc. It is contagious and everything about the patient becomes infected, especially the locality. It is conveyed by rat fleas and probably by other blood-sucking insects. Plague patients should be isolated and everything which comes in contact with them disinfected. Rats and vermin of every sort must be systematically destroyed, and the utmost cleanliness insisted upon. No one with a wound, sore, or even a scratch, should nurse plague patients or visit an infected locality. Nurses should wear leggins and should frequently disinfect their hands, mouths, and nostrils.

In *typhus fever* the infection is conveyed by the bite of the body louse; probably also by the head louse and "crab" louse.

The body and clothing of the patient must be thoroughly disinfected in such a way as to kill all lice and their eggs; then there will be no danger of catching the disease provided the surroundings of the patient are also clean and free from vermin.

X-Ray Precautions. When working with or around X-ray apparatus, the rœntgenologist will usually caution you as to certain dangers. *Extensive* exposure to X-rays results in serious injury to the skin. Such injury does not manifest itself at once but may develop some weeks later. To a degree, the action is cumulative, so that a single dose, in itself too small for injury, may, when frequently repeated, be harmful.

Ordinarily an X-ray operator can do only three things for self-protection: 1. Increase as far as possible his distance from the tube in which the rays are being generated; 2. interpose absorbing material between himself and the tube; 3. reduce the time devoted to an X-ray exposure. The 2nd is the most practical method. Sheets of lead and glass are used for this purpose. Whenever possible the operator and attendants should place themselves behind a screen containing lead, whenever the X-rays are being used.

In addition to this lead protection, operators and attendants must keep several feet from the tube in treatment and heavy radiography. In using a fluoroscope, a careful test must be made to insure that no direct rays come through bad joints, holes in lead or other unprotected openings. A fluoroscopic screen is usually protected with lead glass. Under no circumstances should operator or attendant permit the use of any part of his body for fluoroscopic demonstration, nor should he hold any plate or dental film in position during exposure. This applies to those habitually, especially daily, in attendance on patients requiring X-ray work.

In addition to the X-rays themselves, there are certain electrical dangers connected with the use of high-powered X-ray apparatus against which precautions must be taken. Fatal results may follow, and in any event severe nervous shock, if one gets too near high tension lines while the apparatus is being used. In these instances the discharge is grounded through a person's body. All high tension lines must be kept at least twice as far from any portion of the body as the spark gap being employed.

Films instead of plates are now in almost general use. In all rooms where X-ray films are stored, handled or filed, smoking must be strictly prohibited and conspicuous "NO SMOKING" signs posted. In rooms where films are filed or handled there should be no flames or other than standard electrical fixtures. All open lamp bulbs should be protected from breakage by suitable guards. A fire extinguisher should be immediately available.

A metal can, preferably one with a spring hinged cover, should be provided for all waste negatives and film scraps, and at no time should these be permitted to accumulate and lie around on tables, benches or floor. In all hospitals where films are kept in large quantities, special precautions must be taken to reduce the fire hazard. Fire-proof vaults or rooms suitably prepared are usually set aside for the storage of film material.

Laboratory Precautions. If employed in a bacteriological laboratory, an assignment frequently happening in many of the smaller hospitals in addition to other duties, among other rules observe the following:

Wear a gown or other protective covering over the uniform when in the laboratory. This prevents carrying infectious material to the mess or wards of the hospital. Wash and disinfect your hands, and remove gowns, before leaving the laboratory.

Place all discarded cultures and slides in receptacles provided for that purpose. Thoroughly destroy by suitable disinfection, boiling, or other means, all discarded culture material.

It must be remembered that some of the cultures grown in a laboratory are highly virulent and dangerous to life should they gain access to and develop in one's body. Therefore, if a culture tube or other receptacle be dropped on the floor, breaking the glass, or the contents merely be spilled, don't clean it up until everything has been disinfected for at least one hour; wet a towel in antiseptic solution and cover the entire contaminated area, and then call the attention of all workers in the laboratory to what has happened.

Never put a piece of glass tubing, such as a pipette, or any other material, even pencils or pens, in your mouth unless you know that they are sterile.

Keep the laboratory desk, and the floor area around it, scrupulously clean. Label everything, especially cultures, smears, etc. and do it legibly.

Before leaving the laboratory, clean the oil-immersion lens on the microscope and carefully cover the latter to keep it free from dust.

Don't keep gas burners lighted when not in use. Don't allow sterilizers and water baths to boil dry. Don't leave stoppers out of bottles. Don't leave cultures (i.e., micro-organisms being grown on or in material known as "'media"), lying around loose.

Useful Medical Definitions. A famous scientist once said "of all things on the face of the earth, definitions are the most accursed."

Many terms entirely foreign to the newcomer in a hospital are used and described in the various chapters of this book. In addition, as a matter of mere routine many others are heard by an attendant in his daily contacts with medical officers and others at the bedside, in operating rooms, and elsewhere about the hospital.

To those without previous hospital experience or training along medical lines, there is scarcely a remark used in discussing the observation, care, and treatment of a patient that does not contain a word or phrase absolutely unintelligible to the beginner. For example, a medical officer may tell such beginner to have the nurse bring him a *scalpel.* To express it crudely, the man probably hasn't the remotest idea as to what is wanted; whether the article is something to be hung around the neck, or resembles a spade. Of course, if he properly delivers the message his responsibility ceases. However, if the novice is at all observing and on his own initiative will take the trouble occasionally to look up the meaning of all these strange words being used within his hearing, he will be very agreeably surprised in but a short time to note the progress being made in acquiring familiarity with them. Later on, when told to bring a *stethoscope,* he immediately knows not only what the instrument looks like but also for what purpose it is used.

In urging a speaking acquaintance, as it were, with many of these technical terms, we do not look upon you as being in training to become a physician, but we do know that you can improve your medical vocabulary, and increase your efficiency in the care of the sick and wounded, merely by being attentive, keeping your eyes and ears open, and occasionally "looking up" or asking questions about, terms which are meaningless to you. To aid and encourage you in seeking this additional knowledge some of the most common words or terms employed in a hospital environment and not clearly described elsewhere, are listed in alphabetical order and briefly defined below.

Abnormal. Not normal, contrary to the rule or type, irregular.

Abrasion. An excoriation. A circumscribed removal of the epidermis of skin or mucous membrane.

Absorbent. Having the power to absorb, suck up, or take into itself any gas or liquid, or the light rays.

Accretion. Growth by external additions.

Acidosis. Oxyosis. Lessened alkalinity of the blood and tissues owing to the presence of an excess of acid products.

Acrid. Sharp, pungent, biting, irritating.

Actual Cautery. A hot iron used in cauterization.

Acute. Of short and rapid course; opposed to chronic. In pain, acute means severe, sharp.

Adenoids. Abnormal growths in the naso-pharynx, occurring in early life.

Adhesion. The growing together of two surfaces or parts, especially the union of the opposing surfaces of a wound.

Adipose. Fatty.

Adolescent. The period between puberty and maturity.

Aerated. Charged with air, carbon dioxide, or other gas.

Affection. In medicine, an abnormal condition of body or mind; disease.

Air-hunger. Dyspnea characterized by deep labored respirations, such as occurs sometimes in acidosis.

Air-sickness. A condition resembling seasickness to which one is exposed in an airplane flight, when variations in the atmospheric pressure cause sudden and unusual movements of the plane.

Albuminuria. The presence of albumin in the urine as voided.

Algid. Cold, chilly.

Alkaline. Relating to an alkali; having the reaction of an alkali.

Ambulant, Ambulatory. Moving about; pains and other symptoms which shift about from one place to another. A patient not confined to bed.

Amnesia. Loss of memory for words.

Ampule. A minute sealed flask containing usually one dose of a liquid for hypodermic administration.

Amputation. The cutting off of a limb or part of a limb, the breast, or other projecting part of the body.

Analgesia. Insensibility to pain.

Analysis. The breaking up of a chemical compound into its simpler elements; a process by which the composition of a substance is determined.

Anasarca. General dropsy. An accumulation of serum in the cellular tissues.

Anesthesia. Loss of sensation, especially of tactile sensibility.

Anorexia. Loss or diminution of appetite.

Anuria. An absence or deficiency of urine.

Anastomosis. A communication or opening between two blood-vessels or other tubular structures.

Anemia. Deficiency in the number of red corpuscles or of the coloring matter of the blood.

Aneurysm Needle. A curved, blunt instrument, with an eye near the end, used for passing a ligature under an artery.

Ante-Mortem. Before death, contrasting with post-mortem.

Anti-. A prefix signifying against, opposing; or, in relation to symptoms and diseases, curative.

Antibodies. Substances in the body which are antagonistic to disease.

Antidote. An agent which neutralizes a poison or counteracts its effect.

Antigen. Any substance which, when introduced into an animal organism, causes the production of an antibody.

Antiseptic. Destructive to the germs of disease, fermentation, or putrefaction.

Aperient. Slightly cathartic. A laxative or mild cathartic.

Aphasia. Partial or complete loss of the power of speech.

Aphonia. Loss of voice.

Applicator. A slender rod of wood or flexible metal, at one end of which is attached a pledget of cotton or other substance for making local applications to the nose, throat or other cavity.

Apposition. In contact; fitted or fitting together.

Aromatic. Having an agreeable, somewhat pungent, spicy odor.

Arthritis. Inflammation of a joint.

Ascites. An abnormal collection of serous fluid in the abdominal cavity.

Aspirator. An instrument for withdrawing fluids from cavities by aid of a vacuum container.

Asthenia. Loss of strength; weakness, exhaustion.

Ataxia. Incoordination of muscular action, producing unsteadiness.

Atomizer. An instrument for producing a fine spray.

Atrophy. The wasting away of a part.

Auditory. Pertaining to hearing.

Aura. A peculiar sensation, such as usually precedes an epileptic fit.

Auscultation. The act of listening to sounds produced in organs of the body, usually the heart and lungs.

Autoclave. A device for sterilizing by means of steam heat under pressure.

Autogenous. Originating within the body, self generated.

Autopsy. Post-mortem examination; an examination of the internal organs of a dead body for the purpose of determining the cause of death, or of studying the pathological changes present; necropsy.

Axilla. The armpit.

Bandage. A piece of cloth or other material, of varying shape and size, applied to a limb or other part of the body, to make compression, prevent motion, retain surgical dressings, etc.

Beaker. A thin glass vessel, with a lip for pouring, used chiefly by chemists for heating liquids.

Bedsore. Decubitus; an ulceration occurring on a part of the body exposed to pressure, in one confined to bed by a protracted disease.

Benign. Of a mild character; not malignant.

Bistoury. A long narrow-bladed knife used in surgery. May be straight or curved, sharp or blunt pointed.

Blood-pressure Apparatus. Sphygmomanometer. A device for measuring blood-pressure through aid of an armlet attached to patient. There are aneroid and mercurial types.

Bougie. A cylindrical instrument used for dilating strictures or canals.

Borborygmus. Rumbling in the intestines.

Bronchoscope. An instrument used in inspecting the interior of the bronchi for the detection and removal of foreign bodies.

Burette. An apparatus for delivering measured quantities of a liquid, the flow being controlled by a clip.

Cachexia. A general lack of nutrition, and wasting occurring in the course of a chronic disease.

Cadaver. The dead body.

Caries. A local death of bone.

Calculus. A stony substance formed in the body.

Cannula. A small tube for insertion into the body.

Capillary. Hair-like in size.

Cardiac. Relating to the heart.

Carrier. An individual who harbors in his body the germs of a disease, without symptoms, and thus may act as a spreader of infection.

Catgut. Sheep's intestine twisted into cords of varying thickness, used in medicine as an absorbable suture and ligature material.

Catheter. Any of the various instruments for passing along mucous canals to dilate them or to withdraw fluid from a cavity.

Catlin. A long double-edged amputating knife.

Caustic Holder. A little case for holding a piece of caustic, usually made of gutta-percha or silver.

Cautery. An agent used for scarring or burning the skin or tissues by means of heat or of caustic chemicals.

Centrifuge. An apparatus by means of which solid particles in suspension in a fluid are separated by rapid revolutions.

Cerumen. The wax-like material secreted by cells in the external auditory canal.

Chorea. A disease characterized by involuntary muscular twitchings; St. Vitus's dance.

Chronic. Of long duration; a disease of slow progress and long continuance; the reverse of acute.

Cicatrix. The scar which remains after the healing of a wound.

Circumscribed. Distinctly limited.

Cirrhotic. Affected with cirrhosis i. e. a condition in which the tissues of an organ first become thickened and then atrophied and hardened.

Clamp. An instrument for making compression of an artery, the pedicle of a tumor, or other structures.

Clinical. Relating to the bedside of a patient or the cause of his disease.

Closed Stool. A covered pail used by special patients in defecating.

Coagulate. To convert a fluid into a soft jelly-like solid. To clot, to curdle, to change from a fluid state to that of a soft, jelly-like solid.

Coaptation. The adjustment of separated parts to each other.

Collapse. Complete prostration of the vital powers.

Coma. A state of profound stupor.

Coma-vigil. A condition of unconsciousness and delirium in which the patient lies with open eyes.

Commode. A term sometimes used in lieu of closed stool. Receives bowel deposits.

Compressed Air Apparatus. Consists of a metal air container, a force pump for compressing the air, tubing for connections, a cut-off for controlling the escape of the compressed air, and a set of spray tubes.

Congenital. Existing at birth, referring to certain mental or physical traits or peculiarities, diseases, etc.

Constipation. A condition in which the evacuations from the bowels are infrequent or incomplete, more or less fecal matter being retained in the intestine.

Constitutional. Affecting the whole body.

Contra-indication. An indication against.

Convalescence. The time elapsing between the termination of a disease and the patient's complete restoration to health.

Convulsions. Involuntary contractions of the muscles.

Co-ordination. The harmonious working together of different parts.

Copulation. Sexual union between two individuals, male and female; coitus.

Corpse. A dead body, cadaver.

Corrode. To wear away gradually by pressure, as in case of the tissues by a tumor or aneurysm, or by chemical action, as in case of the enamel of the teeth by acid secretions.

Cortex. The outer layers of an organ.

Crepitation. Crackling; the quality of sound of a crepitant rale, resembling that heard on rubbing a lock of hair between the fingers. The sensation felt on placing the hand over the seat of a fracture when the broken ends of the bone are moved.

Crisis. The turning point of a disease.

Cubicle Method. Hospital care of patients with contagious diseases, each being in a compartment separated from the general ward by a low partition or sheet, thus securing isolation while providing for light and ventilation.

Cumulative. Increasing by successive additions.

Curettage. Scraping the interior of a cavity with the curette for the removal of new growths or other abnormal tissues.

Cutaneous. Relating to the skin.

Cyanosis. Bluish color of the skin, due to imperfect oxidation of the blood.

Cystic. Relating to the urinary bladder or gall-bladder.

Death-rattle. A gurgling or rattling in the throat of a moribund person, caused by an accumulation of mucus in the respiratory passages.

Debility. Weakness.

Decubitus. The recumbent posture. Lying down. A form of bedsore.

Defecation. Evacuation of the bowels.

Deformity. A deviation from the normal shape or size, resulting in disfigurement.

Degeneration. Deterioration of a tissue.

Deglutition. The act of swallowing.

Dehydrate. To deprive of water.

Delirium. A wandering of the mind.

Delouse. To free from infestation with lice.

Delusion. A false mental impression as to things perceived by the senses.

Dementia. A form of insanity with loss of the reasoning powers.

Demulcent. Soothing.

Depletion. The withdrawal of fluid from some part of the body.

Desiccation. Drying up.

Desquamation. Peeling off; e. g. of the outer skin.

Devitalize. To deprive of vitality, or life.

Diagnosis. The recognition of disease from its signs and symptoms; distinguishing one disease from another.

Diaphoresis. Profuse perspiration.

Dicrotic. Having a double beat.

Diet. Food and drink in general. A prescribed course of eating and drinking, in which the amount and kind of food, as well as the times at which it is to be taken, are regulated by a physician. To take only simple and easily digestible food in moderate amount.

Digital. Pertaining to the fingers or toes.

Distal. Farthest from the heart.

Diuresis. Excessive secretion of urine.

Dorsal. Pertaining to the back.

Douche. A stream of liquid directed forcibly against a part.

Drainage. The continuous withdrawal of pus and other fluids from a wound or other cavity.

Drastic. Strongly active.

Dressing. The material applied to a wound for the purpose of excluding the air, stimulating repair, etc.

Dropsy. The effusion of fluid into tissues or cavities of the body.

Dyspnoea. Difficult or labored breathing.

Ecchymosis. An extravasation of blood under the skin.

Edema. Oedema. Accumulation of serum in the cellular tissue. Swelling.

Effervescent. Boiling, bubbling, effervescing.

Effusion. The escape of fluid from its containing vessels into tissues or cavities. The effused fluid or effluent.

Elevator. An instrument for raising depressed pieces of bone.

Elixir. A sweetened, aromatic, alcoholic liquid containing usually some active medicinal substance or serving as a vehicle for such in extemporaneous prescriptions.

Embalm. To treat a dead body with preparations to preserve it from decay.

Embolism. Obstruction or occlusion of a vessel by a transported clot or vegetation, a mass of bacteria, or other foreign material.

Emetic. Relating to or causing vomiting. An agent which causes vomiting, emesis.

Emollient. Soothing to skin or mucous membrane. An agent which softens the skin or soothes irritation in skin or mucous membrane.

Empyema. A collection of pus, usually meaning in the pleural cavity.

Endemic. Peculiar to a locality.

Enteric. Pertaining to the intestine.

Enuresis. Incontinence of urine.

Epidemic. A disease attacking nearly simultaneously a large number of people in a community; it is distinguished from endemic in that the disease is not indigenous or continuously present but has been introduced from without. The extensive prevalence in a community of a disease brought from without, or a temporary increase in number of cases of an endemic disease.

Epigastrium. The region near the stomach.

Eruption. A breaking out of the skin due to disease.

Eructation. Belching up of gas from the stomach.

Erlen-Meyer Flask. A thin glass flask, flat bottomed and cone-shaped, allowing its contents to be shaken laterally without danger of spilling.

Escharotic. A substance which occasions sloughing.

Esmarch's Bandage. A rubber bandage which is wound tightly about a limb from the periphery toward the center to produce a bloodless field for operation, the return of the blood after removal of the bandage being prevented by a strong ligature around the proximal end of the extremity.

Evacuation. In medicine, removal of waste material, especially from the bowels. A discharge from the bowels, stool.

Exacerbation. Increased severity of the symptoms of a disorder.

Excision. Act of cutting out or away.

Excoriation. Abrasion of the skin.

Excrement. Excreta. The natural discharges of the body, especially feces and urine.

Excretion. The discharge of waste matter from the body, or the material so discharged.

Expectoration. Sputum; mucus and other fluids formed in the air-passages and expelled by coughing. Spitting; the expelling from the mouth of saliva, mucus, and other material from the air-passages.

Extirpation. The complete removal of a part in surgery.

Extravasation. Effusion of fluid into the tissues.

Exudation. The oozing out of fluids.

Eye-cup. A small oblong cup-like receptacle, fitting over the eye, intended to facilitate the application of a liquid medicament to the conjunctiva.

Facies. Face, countenance. Expression. Appearance.

Febrile. Pertaining to fever.

Fecal. Pertaining to or like feces.

Feces. The discharges from the bowel.

Finger Cot. A rubber nipple-like cap for a finger. Also called a stall.

Finger-print. An impression of the inked bulb of the distal phalanx of a finger, showing the configuration of the ridges, employed as a means of identification. Foot prints of infants also used.

Fissure. A crack.

Fistula. An abnormal opening between two parts of the body.

Fluctuation. A wave-like motion felt on palpating a cavity with non-rigid walls, like the abdomen, when containing fluid.

Flatus. Gas in the stomach or intestines, especially the latter

Fluoroscope. An apparatus for rendering visible the shadows produced by the X-ray.

Forceps, Bone. For holding or cutting bone during operations.

Forceps, Dental. An instrument used for extracting teeth.

Forceps, Dissecting. Plain forceps used for dissecting purposes.

Forceps, Dressing. Forceps with scissor-handles, used for removing and handling old dressings, in treatment of wounds and sores.

Forceps, Gouge. A strong forceps, cutting at the points, so as to gouge out pieces of bone.

Forceps, Hemostatic. Forceps for taking up arteries and avoiding or arresting hemorrhage.

Forceps, Mouse-tooth. Forceps with fine, sharp teeth, used in dissecting.

Forceps, Needle-holder. Forceps to hold the needle in sewing wounds.

Forceps, Polypus. Forceps for grasping small tumors, usually in the nasal cavity.

Forceps, Sterilizer. For removing instruments from a sterilizer.

Forceps, Tongue. For grasping and holding the tongue during anaesthesia.

Fountain Syringe. An apparatus consisting of a reservoir for holding fluid, to the bottom of which is attached a tube armed with a suitable nozzle; used for vaginal or rectal injections, irrigating wounds, etc., the force of the flow being regulated by the height of the reservoir above the point of discharge.

Fowler's Position. An inclined position obtained by raising the head of the bed from 2 to 2½ feet in order to insure proper drainage after an abdominal operation.

Friction. Rubbing. The resistance to movement between two bodies in contact with each other.

Function. The normal office or duty of a part or organ.

Functional. Affecting the functions of the body.

Furunculosis. The diseased condition associated with the appearance of furuncles or boils.

Fusion. Liquefaction by heat, melting. Uniting, joining together.

Gargle. A throat wash. To rinse the fauces by taking fluid in the mouth and forcing the expired breath through it while the head is held far back.

Gavage. Feeding through a stomach tube, sometimes forcibly against the patient's wishes.

Genitals. Genitalia. The sexual organs. The organs of generation.

Germicide. An agent which is destructive to germs or microbes.

Glycosuria. The passage of sugar in the urine.

Graduate. A vessel, usually of glass, suitably marked, used for measuring liquids.

Groin. The depression between the abdomen and the thigh.

Grooved Director. A slender grooved instrument upon which a knife is made to slide in order to limit the extent of motion of the latter or prevent its injuring the parts beneath.

Guillotine. A sliding knife for slicing out the tonsil.

Hallucination. A fancied perception of objects or sensations which have no reality and do not exist.

Head Mirror. A round mirror worn on the forehead in the examination of the throat and ear, and in operations.

Heliotherapy. Treatment of disease by exposure to the direct rays of the sun.

Hematemesis. The vomiting of blood.

Hemoptysis. The coughing up of blood.

Hemostatic. Arresting hemorrhage. An agent to stop hemorrhage.

Hepatic. Relating to the liver.

Herniotomy. Operation for the relief or cure of hernia.

Herpes. Fever blisters; "cold sores."

Hiccough. The spasmodic contraction of the diaphragm with sudden closure of the glottis.

Hyper-. A prefix denoting excessive, above the normal.

Hypertrophy. An abnormal increase in the size of a part or organ.

Hypo-. A prefix denoting less or under the normal, or a location beneath something else. Also slang term for hypodermic injections or the syringe used in giving them.

Hypodermic Syringe. A graduated glass or metal syringe fitted with a hollow needle, employed in the injection of morphine and other medicines beneath the skin.

Idiosyncrasy. An individual peculiarity by which one person differs from others.

Illicit. Unlawful. Wrong.

Illusion. A false perception of an external object.

Immune. Free from possibility of infection.

Immunity. Security against any particular disease.

Incision. A cut. A division of the soft parts made with a knife.

Incontinence. Involuntary evacuation of the urine or feces.

Incubator. A cabinet in which a uniform temperature of any desired degree can be maintained; used for keeping bacterial cultures. A box-like construction with glass sides, with a ventilating apparatus for the supply of an abundance of pure air at body temperature, designed for the protection of prematurely born infants.

Incubation Period. Time elapsing between exposure to a disease and its manifestation.

Induration. Hardness, or hardening of a part.

Ingestion. The act of taking food, medicines, etc., into the body.

Inhalation. To breathe. Inspiration, drawing in the breath. Drawing a medicated vapor in with the breath. A medicated liquid intended for inhalation in the form of vapor.

Inhibit. To check or suppress.

Irrigate. To wash out a cavity with water or a medicated fluid.

Irrigator. A metal or glass vessel to which a tube is attached fitted with a nozzle and stop-cock, used for flushing or washing wounds.

Insecticide. Causing the destruction of insects in the widest sense of the term.

Insomnia. Inability to sleep. Sleeplessness.

Intravenous. Within a vein.

Intubation. The insertion of a tube into the larynx, especially to prevent suffocation in diphtheria.

Inunction. The act of rubbing in an ointment.

Isolation. Separation from others.

Juxtaposition. Close together.

Knife, Amputating. Used for amputating a limb; a large one for amputating the thigh, a medium size for the leg, a small one for the arm.

Knife, Tenotomy. A small narrow knife for cutting tendons under the skin.

Laceration. A tear or torn wound. The process or act of tearing the tissue.

Lachrymal. Relating to the tears or weeping.

Lancet. A surgical knife with a short, wide, sharp-pointed, two-edged blade.

Laparotomy. Incision through any part of the abdominal wall; celiotomy, abdominal section.

Laryngoscope. A small round mirror, attached at an angle to a rod-like handle, used to obtain a view of the interior of the larynx.

Latent. Concealed, not manifest.

Lateral. On the side.

Lavage. The washing out of a hollow organ, as the stomach or lower bowel, by copious injections and rejections of water.

Leiter's Coil. A flexible tube, coiled into shape to fit the surface to which it is applied, through which cold or hot water flows continuously.

Lesion. A wound or injury. A more or less circumscribed pathological change in the tissues. One of the individual points or patches of a disease of the skin.

Lethargy. Stupor. A condition of drowsiness.

Ligate. To tie or bind with a ligature.

Ligature. Threads of sterilized silk, catgut, tendon or other material used for tying up blood-vessels or sewing up wounds.

Litmus. Litmus paper. Blotting paper stained with litmus, employed to test the reaction of urine and other fluids, being turned red if the fluid is acid, and remaining blue if alkaline.

Livid. Having a dusky bluish color, due to congestion.

Lumen. The space inside of a tube.

Lysis. Gradual decline, more especially of a febrile disease.

Lyssophobia. A neurosis resembling hydrophobia in its symptoms, sometimes affecting one who has been bitten by a supposedly rabid dog and who is morbidly apprehensive of having the disease.

Malaise. Indisposition. A feeling of uneasiness or discomfort.

Mal de mer. Seasickness.

Malignant. A condition threatening life; the reverse of benign.

Malingerer. One who feigns disease.

Marasmus. A wasting or emaciation. Wasting away.

Massage. A scientific method of manipulation of the body by rubbing, pinching, kneading, tapping, etc.; it is employed in therapeutics to increase metabolism, promote absorption, stretch adhesions, etc.

Meatus. A passage or opening, such as the urinary meatus.

Median Line. An imaginary line dividing the body longitudinally into two parts.

Metabolism. The power possessed by cells to use up and to renew the matter composing the body.

Micturition. The act of voiding urine. Urination.

Migraine. Sick headache.

Morbid. Diseased. Pathological. Low in mind.

Moribund. Dying. At the point of death.

Moron. Stupid. A feeble-minded person, but of higher grade than an imbecile. Intelligence of a child of 12 or under.

Morose. Of a sour temper; sullen; ill-humored.

Mortuary. Dead-house, an out-building in a hospital or other institution, where the dead are placed before burial.

Mouth Gag. An appliance for holding open the mouth.

Murphy Button. A device for reuniting two parts of the intestine after complete division, consisting of two hollow silver pieces which fit into each other and bring the peritoneal edges into close contact.

Nares. The nostrils.

Nates. The buttocks.

Nausea. Sickness at the stomach, an inclination to vomit.

Necrosis. Death of tissue.

Neuropsychiatry. Combined neurology and psychiatry, the specialty dealing with diseases of both mind and nervous system.

Neutralize. To render ineffective.

Nightmare. A terrifying dream in which one is unable to cry for help or to escape from seemingly impending evil.

Nits. The eggs of lice.

Non Compos Mentis. Of unsound mind.

Normal. Natural. According to rule.

Nostalgia. Homesickness, a longing to return to one's home or former place of residence.

Nostrum. A quack medicine; a therapeutic agent, secret or patented, which is offered to the general public as a specific remedy for any disease or class of diseases.

Occlusion. A sealing or blocking up.

-ology. A suffix denoting a science or special branch of study.

Operation. Any surgical procedure. The act of operating. The action of a drug or other remedy. An evacuation of the bowels.

Ophthalmia. Inflammation of the conjunctiva of the eye.

Opthalmoscope. A mirrored instrument for examining the eye.

Organ. Any part of the body having a special function.

Organism. A name applied to the assemblage of organs constituting a living being.

Orthopedic. Pertaining to the correction of deformity, especially in joints.

Orthopnoea. Difficulty in breathing relieved only by the upright position.

Osseous. Of the quality of a bone; bony.

Otoscope. An instrument for examining the drum-membranes or auscultating the ear.

Palliative. Mitigating, relieving. Lessening the effect.

Palpate. To examine by feeling and pressing with the palms of the hands and the fingers.

Paquelin's Cautery. A cauterizing apparatus consisting of a hollow platinum body, in the shape of a knife, needle, ball, etc., which is heated by the forcing into it of a mixture of the vapor of benzine and air.

Paracentesis. The operation of puncturing a cavity of the body, in order to draw off fluid.

Patulous. Wide open. Expanded.

Percussion. Light tapping or striking on any part of the body for diagnostic purposes.

Perforation. An opening or penetration.

Periosteotome. An instrument for separating the periosteum from bone.

Pernicious. Destructive, harmful; disease of severe character and usually fatal.

Petri Dishes. Round glass dishes, fitting one above the other in a pile, about ½ inch deep and 4 inches in diameter; normally used for holding bacterial cultures.

Phimosis. Narrowness of the opening of the prepuce preventing its being drawn back over the glans penis.

Phobia. Any unreasonable or insane dread or fear.

Photophobia. Abnormal sensitiveness of eyes to light.

Pipette. A small glass tube for taking up fluids.

Politzer Bag. A rubber air bag with nozzle, used in inflating the ear through the eustachian tube.

Polyuria. Excessive secretion of urine.

Post-Mortem. After death. A post-mortem examination, autopsy; necropsy.

Primary. First, principal.

Probe. A slender rod of silver or other flexible metal, with blunt bulbous tip, used for exploring sinuses, fistulas, or other cavities, or wounds.

Prolapse. A falling down.

Prone. Lying with the face downward.

Prophylaxis. The prevention of disease.

Proximal. Nearest the heart.

Psychosis. A disorder of the mind, insanity.

Puberty. The age at which the reproductive organs become developed.

Pulmotor. An apparatus for supplying oxygen to the lungs and inducing artificial respiration in cases of asphyxiation by illuminating gas, drowning, etc.

Pungent. Acrid, penetrating; as a pungent odor.

Purge. To cause a copious evacuation of the bowels.

Purulent. Containing or consisting of pus.

Pus. The creamy looking liquid resulting from suppuration.

Pyo-. A prefix denoting suppuration or an accumulation of pus.

Quarantine. Enforced isolation as a preventive against contagion or the spread of disease.

Quotidian. Occuring every day; e. g. quotidian fever in which the paroxysm occurs every day.

Radical. A form of treatment meant to destroy a disease or correct any abnormality.

Rales. Sounds in the air-passages produced by air passing through fluid.

Reaction. Recuperation or return of power after depression.

Rectal Tube. A lavage tube.

Recumbent. Reclining. Normally, on back.

Recurrent. Returning at intervals.

Refrigerant. Producing cold.

Regurgitation. The flowing back or the rejection of the contents of a hollow organ.

Relapse. Recurrence of a disease before complete convalescence.

Relaxation. Remitting tension. The reverse of contraction.

Remittent. Alternately abating and returning.

Resect. To cut off.

Resolution. The gradual return of the tissues to their normal condition after inflammatory conditions.

Restraint Apparatus. Strait Jacket. A device for controlling a violent patient. Normally consists of a bed strap which is firmly fastened to the bed before the patient is placed upon it; a breast strap which fastens the patient to the bed strap and bed, anklets, wristlets, a muff, and a set of keys, by which the buckles of the apparatus can be locked. May be improvised.

Resuscitate. To revive, to restore to life after apparent death.

Retching. Attempts at vomiting.

Retention. Holding back. The act of retaining urine in the bladder.

Retractor. An instrument for holding apart the edges of wounds in operating.

Rhythm. Measured time or motion.

Rigor. A chill. Rigidity.

Roentgenology. The study of the Roentgen rays in all their application.

Sac. A bag or pouch.

Saline. Relating to, of the nature of, or containing salt; salty.

Salivation. An excessive flow of saliva.

Sanitary. Healthful, conducive to health.

Scalpel. A short knife with a curved edge, made in different sizes and used for cutting and dissecting.

Scarification. Making several small incisions. Scraping.

Scoop. A spoon-shaped instrument used for scraping various growths, etc. A curette.

Scybala. Hard lumps of fecal matter.

Sedative. Quieting.

Sequela. Abnormal condition following the decline of a disease. Undesirable after-effects. Supervening.

Serous. Having the nature of serum.

Shell-shock. A general term used to cover all serious mental and nervous disturbances arising as a result of the circumstances of battle; the condition may be due to trauma of the head or other parts, to the atmospheric shock of near-by explosions, to prolonged or extreme mental and physical strain, and sometimes solely to fatigue and loss of sleep under the excitement of battle in men of neuropathic heredity; war neurosis.

Singultus. Hiccough.

Siphon. A bent tube or pipe having legs of unequal length; when the shorter leg is inserted in a vessel containing a liquid and suction is made on the longer leg so as to bring the liquid over the bend into the longer leg, the liquid will continue to flow through the siphon until the vessel is empty.

Slough. A portion of dead tissue which comes away after an ulcerative process.

Snare. An instrument for use in removing small growths and other projections from any surface, especially one within a cavity.

Sopor. A drowsy condition.

Sordes. The brownish deposit that tends to accumulate about the teeth in disease.

Sound. A metal instrument for feeling what is beyond the reach of the fingers, or for dilating a canal such as the urethra.

Spud. A metal instrument for removing foreign bodies from the eye.

Sponge-holder. An instrument for holding sponges when operating in cavities.

Sporadic. Occuring in single or scattered cases.

Sphygmomanometer. Blood-pressure apparatus.

Sphincter. A circular muscle constricting a natural opening.

Sputum. The spittle ejected (expectorated) from the mouth.

Stenosis. Constriction or narrowing.

Stercoraceous. A term applied to vomited matter containing feces.

Stertorous. Breathing with a snoring sound.

Stethoscope. An instrument used in auscultation, as of the chest, to convey to the ear the sounds produced in the body.

Stomach-tube. A large soft-rubber tube used for washing out or emptying the stomach.

Stomatitis. Inflammation of the mouth.

Stool. An evacuation of the bowels. Feces, the matter discharged at one movement of the bowels.

Strait-jacket. See restraint apparatus.

Strangury. Slow and painful passage of urine, drop by drop.

Stricture. A contraction of a duct or tube.

Stupe. A compress or cloth wrung out of hot water, usually impregnated with turpentine or other irritant, applied to the surface to produce counter-irritation.

Subsultus Tendinum. Muscular tremor or twitching.

Sudorific. Sweat-producing; an agent which induces sweating.

Supine. Lying flat or on the back.

Suppression. Failure of kidneys to secrete urine.

Suspensory. A bandage applied as a support to a dependent part, such as the scrotum or a pendulous breast.

Sutures. Threads of wire, silk, catgut, silk-worm gut, horsehair, tendon, etc., used by the surgeons for stitching wounds or tying vessels.

Swab. A tuft of cotton, ball of gauze, or the like attached to the end of a stick or other holder; used for cleansing cavities or applying remedies to the walls of cavities or to a surface.

Syncope. Fainting or swooning.

Syringe. An instrument made of glass, hard-rubber, or metal, used for injecting fluids.

Tactile. Relating to the sense of touch.

Tap. To withdraw fluid from a cavity by means of a trocar and cannula, or a hollow needle.

Tenaculum. A sharp-pointed wire hook set in a handle, used for picking up the divided end of an artery, or bits of tissue during an operation.

Tenesmus. Frequent, ineffectual, and painful efforts, coupled with straining, to evacuate the bowels.

Tension. Tightness. A condition of being drawn tight.

Tepid. Lukewarm.

Test Lenses. Glasses of various powers used for testing the eyes for visual acuity and prescribing spectacles.

Test-meal. A simple meal, usually of a slice of bread and sometimes a cup of coffee, given on an empty stomach; after a definite period the contents of the stomach are withdrawn and their condition furnishes evidence as to the digestive power of the stomach.

Test Tube. A thin glass tube, closed below and open at the top. Used for testing.

Thermic Rays. The heat rays of the sun.

Thermo-cautery. An actual cautery in which the fuel is incandescent benzine.

Thrombosis. The formation of a blood-clot in a vessel.

-tomy. A termination denoting a cutting operation.

Tongue Depressor. An appliance for holding down the tongue in throat work.

Tormina. Griping pain in the bowels.

Torsion. Twisting.

Tourniquet. An apparatus for making pressure on an artery to stop the flow of blood through it.

Toxic. Pertaining to poisons; poisonous.

Toxins. Poisons produced by bacterial action.

Tracheotomy-tube. Two curved, silver tubes, one fitting inside the other, used for putting into the windpipe when it has been opened by an operation called tracheotomy.

Transfusion. Process of transferring blood or salt solution into the veins.

Traumatic. Pertaining to a wound.

Trephine. A tubular saw, used in operations on the skull.

Trocar. A sharp-pointed instrument and sheath for tapping collections of fluid. Large, for tapping the belly or chest; small, for tapping the scrotum.

Truss. An appliance used to keep the bowel in its place in cases of hernia.

Turgid. Swollen.

Tuning Fork. A steel instrument consisting of two prongs and a handle which when struck gives a certain fixed tone. Used in testing hearing.

Tussis. Pertaining to cough.

Tympanites. The distension of the abdomen with gas.

Urinalysis. The examination of urine.

Vaccine. An emulsion of dead cultures of specific bacteria in saline solution, employed hypodermically; or the virus of cowpox, or vaccinia, used in vaccination against smallpox.

Varicose. A term applied to dilated and tortuous veins.

Vascular. Pertaining to blood-vessels.

Vasomotor. Presiding over the contraction and expansion of blood-vessels.

Venery. Sexual intercourse.

Venesection. The operation of opening a vein. "Bleeding."

Vertigo. Dizziness, giddiness.

Vesicle. A small blister.

Viable. Capable of living.

Virulent. Extremely poisonous.

Viscera. The internal organs.

Viscid. Sticky, glutinous, adhesive.

Vital. Pertaining to life.

Vulsella. Volsella, a forceps armed at the tips of the blades with sharp-pointed rectangular hooks.

Wassermann Reaction. A diagnostic test for syphilis.

CHAPTER XVIII

MINOR SURGERY

Introduction. At many of our smaller stations the noncommissioned officer of the Medical Service must very frequently act as the surgeon's assistant, performing such duties as in civil life are assigned to a physician. He may have to take entire charge of the anesthetic, or act as the first, second, or other assistant. Indeed, the occasions are not infrequent when the sole medical officer is temporarily absent from the station, or a small detachment is in the field without any medical officer, and the noncommissioned officer himself may have to do minor operations and permanently arrest hemorrhage.

Anesthesia, General and Local. An anesthetic is an agent that abolishes sensation. It may be general or local. The former affects the whole system and produces unconsciousness and muscular relaxation. The later affects only the part to which it is applied, destroying the sensation of the local nerves.

The principal *general anesthetics* are *ether, chloroform,* and *nitrous-oxide gas.* The latter, commonly known as "laughing gas," is an anesthetic very popular in dental operations because of the quickness with which it induces unconsciousness over a period of only a few minutes, and the speedy recovery of the patient with almost total absence of any unpleasant after-effects.

Before commencing the administration of any anesthetic everything should be made ready; the patient should not have any food for five or six hours before commencing anesthesia. His head should rest on a low pillow covered with a towel, and the skin of the face, around the mouth and nose, which is liable to be irritated by the anesthetic, should be protected by vaseline. Artificial or any loose teeth should be removed, as also any constricting bands of the neck, throat or abdomen.

On a small table to the right of the anesthetizer should be placed the appropriate articles; the anesthetic, a screw gag, lever gag, tongue forceps, swab-holder and swab, towel, teaspoon, sterile water, a hypodermic syringe with hypodermic tablets of morphine, digitalis, strychnine, and atropine, vaseline, and a basin for vomitus.

Warmth plays a very important part in anesthesia and the patient should not be exposed more than is absolutely necessary. He should be kept warm by suitable clothing and blankets, and if necessary by hot-water bottles. The temperature of the room should be 70° F.

Ether. *Pure sulphuric ether* is generally considered the safest and best anesthetic for general purposes. It should be kept in tin cans in a cool, dark place. It is about two and a half times heavier than air and inflammable; therefore lights should not be brought near the inhaler, but open lights four or more feet from the patient's head are safe.

Ether is now generally given by the drop method in the same manner as chloroform, save that it is usually administered direct from its original can container, a small wick of gauze being inserted into a puncture made in the top of the can.

The arms of the patient must not be brought above his head nor allowed to hang over the edge of the table, as paralysis has followed the undue pressure in such cases; the forearms should be flexed and folded over the base of the chest, being rolled in the nightshirt to confine them.

Assistants must be careful not to interfere with respiration by leaning on the chest.

Upon starting the anesthetic usually there is a stage of excitement marked by flushed face, increased heart action, some struggling, perhaps tremor and general rigidity of the body; all these symptoms are more marked in alcoholics.

The state of complete anesthesia is marked by relaxation, so that the arm drops when lifted, snoring respiration, and the absence of winking when the eyeball is touched.

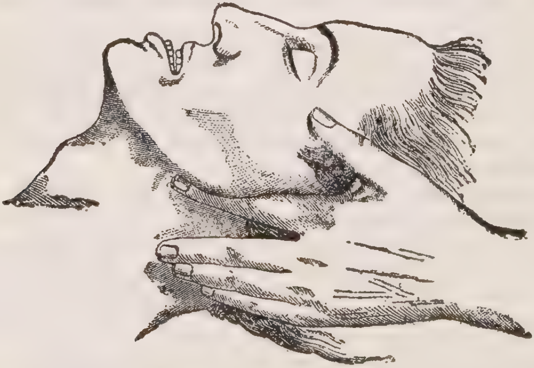


Fig. 155.—Pushing Forward the Jaw for Treatment of Asphyxia.

The anesthetizer must closely watch the pulse, respiration, and color of the patient, as well as his pupils and the conjunctival reflex. In complete anesthesia the pulse and respiration ratio should be about normal, the pupils should be contracted and should react to light.

Danger signals are marked—especially sudden—weakness and rapidity of the pulse, stopping of respiration, cyanosis, dilatation of the pupils, and absence of their reaction to light. The return of the conjunctival reflex—winking on touching the eyeball—indicates that the patient is "coming out" of the anesthetic.

Sudden cessation of respiration is often due to the falling back of the tongue over the opening of the larynx; in such a case the lower jaw should be thrown forward by the fingers behind the angles of the jaw (Fig. 155) and if this does not suffice the teeth must be forced apart, and the tongue drawn forward with tongue forceps (Fig. 156). If the respiration is not at once resumed artificial respiration must be resorted to.

Failure of the pulse is an indication for the use of stimulants and perhaps discontinuance of the ether.

Efforts at vomiting may usually be controlled by giving more ether, but if it can not be prevented the head should be turned on the side to allow the escape of the vomited matter.

Accumulation of mucus in the throat should be removed by a sponge on a sponge-holder.

Chloroform. *Chloroform* is given by the open or "drop method" so as to secure a free admixture of air; it is four times as heavy as air and not inflammable.

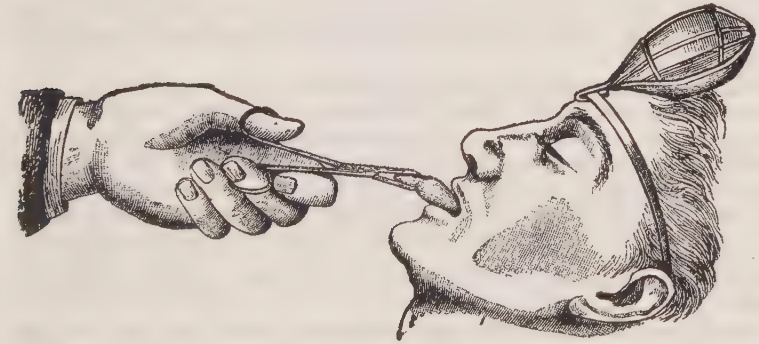


FIG. 156.—Drawing Out the Tongue for Treatment of Asphyxia.

The *Esmarch inhaler* is supplied in the army, but a small handkerchief or a piece of lint folded once answers the purpose very well. In the absence of a chloroform bottle with dropping attachment, one can be extemporized by cutting V-shaped troughs on the opposite sides of the cork.

The same precautions must be observed as in ether anesthesia, remembering that while ether is a heart stimulant chloroform is a heart depressant and that the great danger with chloroform is heart failure.

A few drops of chloroform are placed on the inhaler, which is at first held some distance from the mouth and gradually approached, but never brought close enough to exclude the air. A few drops are added from time to time as the chloroform evaporates, but progressively less after anesthesia becomes complete.

The relative advantages of ether and chloroform may be summed up as follows: Ether is slower, requires much larger quantities, is less pleasant to take, causes much more irritation and costs more; it is usually safer.

In the field chloroform is preferable because of the much smaller quantity which it is required to transport, and the shorter time necessary for anesthesia.

In the tropics ether, on account of its greater volatility, is hard to keep, and much more is required to produce anesthesia.

Local. *Local anesthesia* is very useful in opening boils and abscesses, splitting inflamed piles, and in any operations on the fingers or toes.

There are two general classes of local anesthetics, those which destroy the sensibility of the nerves by freezing, and those which must be injected hypodermically into the part.

Of the freezing agents the best is *ethyl chloride,* which is furnished in metallic tubes arranged so as to throw a fine spray upon the part; the tube should be held at a distance of ten or twelve inches, and when the part suddenly turns white sensation is destroyed. The objection to freezing agents is that the pain in freezing and thawing is almost as great as it would have been from the incision, and that sloughing may follow undue freezing.

The most generally useful local anesthetic is Novocaine, 0.5% to 1% solution, hypodermically. Cocaine, in solution from two to ten per cent, is occasionally applied directly to mucous membranes to allay sensation and permit operative manipulation. In the mucous membranes the anesthesia is produced by the surface application, but in other tissues the local anesthetic must be used hypodermically. The anesthesia commences in a minute or two and lasts about fifteen minutes. If the anesthetic is confined to the part so that the blood can not carry it away, as when a ligature is thrown around the base of a finger or toe, the effect may be maintained indefinitely.

The objection to cocaine is its depressing action on the heart and the danger of contracting the habit. The solutions do not keep well, and should always be freshly prepared and made with sterile water; the solutions themselves can not be sterilized by heat, as heat decomposes the cocaine.

In *Schleich's method* very dilute solutions are used, but the tissues, especially the skin, are infiltrated with them. Schleich used three solutions of different strengths. The medium solution is prepared as follows:

Cocainæ hydrochloridi		100
Morphinæ hydrochloridi		025
Sodii chloridi		200
Aq. destill.	100	000

Sterilize solution and add gtt. ij. of five-per-cent phenol.

The stronger solution contains twice as much cocaine as the above, and the weaker one-tenth as much cocaine and one-fifth as much morphine.

To anesthetize the skin it is necessary to inject the solution *into* and *under* it.

Assisting at and Performing Minor Operations. In an operation the duty of the medical soldier may be to prepare and hand instruments, to sponge, to assist in the operation, or to help in all three ways. He must watch the operation and operator closely and endeavor to anticipate the wants of the surgeon.

The sterilized instruments should all be laid out beforehand, as much as possible in the order in which they will be needed and those of the same kind grouped together. Needles should be secured in a small piece of gauze or placed in a shallow glass dish of alcohol, and a few should always be threaded ready for use. In threading, the suture should be held in the right hand and the needle held in the left and passed over it; catgut or tendon may be cut obliquely and flattened between the handles of a pair of scissors to facilitate threading, but silk must always be cut square across to avoid unraveling.

Iodoform dusters or other unsterilized articles must be wrapped in sterile gauze.

When the sutures are in sealed glass tubes, the tubes must be sterilized in an antiseptic solution, broken in a sterile towel, and the contents dropped in alcohol.

Ligatures should be about nine inches long, and sutures twelve inches.

A complete dressing should be ready in a sterilized towel.

When the intestines are to be exposed hot towels will be needed; to have them ready, sterile water is kept hot and the towels are dipped in when necessary.

Rubber drains usually have a safety pin passed through one end to prevent them from slipping in; gauze-wick drains are prepared by rolling a narrow strip of gauze into a wick about the size of a cigarette and covering it with a layer of rubber tissue.

Instruments should always be handed to the operator with the handle toward his hand, and in such a position that they may be used at once without loss of time; they should not be allowed to accumulate unnecessarily upon the patient's body, and soiled and bloody instruments should be replaced by clean ones.

Sponging must be done quickly in the intervals of the surgeon's work; the gauze sponge should be used with a firm wiping movement in the direction from the bottom of the wound toward the surface.

Retractors are held in such a position that they and the hands of the assistant may be as little in the way as possible; sharp retractors should be used with care.

In suturing, the needle properly threaded and held in the bite of the forceps, should be handed to the surgeon; the assistant then holds the edges of the wound in the proper position for suturing, and is ready with scissors to divide the sutures at the proper time.

When there is no surgeon present with the troops and none is available, the senior noncommissioned officer of the medical detachment must himself undertake necessary minor operations.

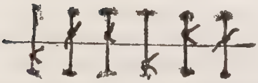


Fig. 157.—The Interrupted Suture.

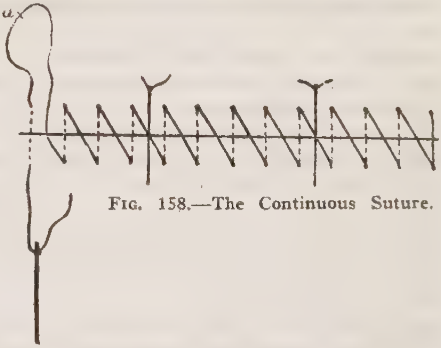


Fig. 158.—The Continuous Suture.

Wounds. *Clean, incised wounds,* the edges of which can not be brought together by the dressing and bandage, should be sutured or sewed up. Dermal, silkworm gut, silk, or catgut may be used, the preference being in the order named; sutures of the first three kinds must be taken out after four or five days; catgut will be absorbed.

Sutures may be interrupted or continuous. In the interrupted suture (Fig. 157) the needle is passed through the skin and subcutaneous tissues about an eighth of an inch from the edge of the wound, and then tied with a *reef* knot; care should be taken not to draw the suture tight enough to contract and pucker the skin; the remaining sutures are then placed about a quarter of an inch apart. The interrupted suture is the one ordinarily used.

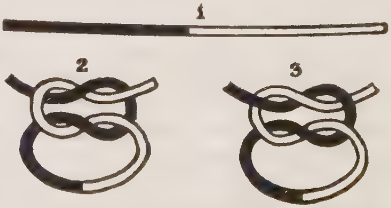


Fig. 159.—Tying Reef and Granny Knots. 1. Piece of Twine. 2. Reef. The Right Way. 3. Granny. The Wrong Way.

The method of tying a knot is extremely important. All medical soldiers should practice and learn how to tie a square or "reef" knot, and in all their work avoid using the "granny" or slip knot. (Fig. 159).

The *continuous suture* (Fig. 158) is applied by continuously passing the needle through the skin without cutting the thread.

If there is any doubt about the cleanliness of the wound or if there is much oozing from it, the lower angle should be left open for drainage.

If the wound is in a hairy part the hair must be clipped close and shaved, and the skin about the wound painted with tincture of iodine. The same precautions as to instruments and the hands are observed as in operation wounds. If the wound is small and not infected, all the dressings needed may be a few shreds of cotton held in place by collodion.

Should the wound contain dirt or other foreign bodies they should be washed away with sterile water, or removed with sterile forceps and flushed out with iodine and alcohol, or with Dakin's solution; as such wounds are sure to be infected a free opening must be left for drainage.

Contused or *lacerated wounds,* unless the contusion is very severe, should also be sutured but not so closely as incised wounds nor should the sutures be made so tight, as much tension and swelling are apt to ensue.

Before any wound is sutured all bleeding should be controlled permanently; if the bleeding is capillary this may be done by exposure to the air, hot water, or pressure; if the hemorrhage is from an artery the spurting point must be found, seized with a pair of artery forceps and twisted, or a catgut ligature may be slipped over the forceps and the vessel tied.

Boils. In *furuncle* or *boil* there is a hard, painful swelling with a central pustule overlying a small slough or *core.* The occurrence of a number of boils in the same neighborhood is usually due to infection from the first one.

If a boil is seen early enough it may sometimes be aborted by dipping a sharpened stick in pure phenol and carrying it down into the core through the central pustule, and then neutralizing with 95% alcohol. If seen later the only thing which will give prompt relief is a free cross cut. The cuts must be deep enough and long enough to go entirely through the hardened part; otherwise they will fail. Use a very sharp scalpel and make each cut at one quick sharp stroke. Local anesthesia, such as an ethyl chloride spray, may be used. After the incision apply a dry dressing or one wet with alcohol. To prevent a succession of boils the skin about the first one should be kept thoroughly clean and disinfected, the hands should be disinfected, and the underclothing frequently changed.

Carbuncles differ from furuncles in being more extensive and severe and in having several openings or *heads;* their treatment is considered a major operation, consisting of multiple incisions, liberal application of a thermo-cautery, and free drainage.

Abscesses. *Felon* is an abscess below the fascia or periosteum in the end of the finger; it is due to infection through a hang-nail or some small wound. The tendency is to spread deeply and not to come to the surface. The pain is intense and throbbing. The treatment consists in making a free incision down to the bone, and gives prompt relief; unless this is done necrosis of the bone may result. Apply a wet dressing.

Abscesses when near the surface may be detected by the soft fluctuating center surrounded by a hard ring. They should be opened with a sharp-pointed curved bistoury thrust through the skin over the top of the abscess, and cutting from within outward. After opening, a drainage tube should be inserted and a dressing applied; the drainage tube may be left in as long as pus continues to flow.

Ulcers are what are commonly called *sores.* They require antiseptic dressings and often the support of an elastic bandage.

An *inflamed hemorrhoid* or *pile* is an extremely painful affection which may be promptly relieved by a very simple operation. The patient complains of a painful swelling at the anus, and on examination a red or purple, hard swelling is found; this is due to the formation of a blood-clot in the pile. With or without novocaine anesthesia run a sharp curved bistoury through the base of the tumor and cut from within outward; this frees the clot and the pain now ceases.

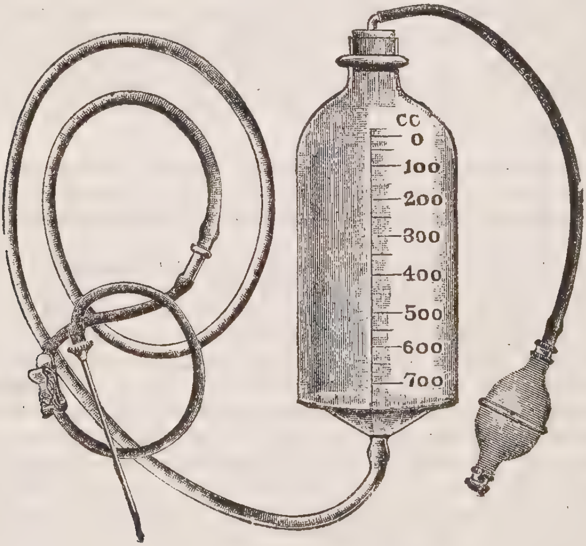


Fig. 160.—Infusion Apparatus.

Subcutaneous and Intravenous Administrations. *Subcutaneous saline infusions* are frequently given in hospitals for shock, hemorrhage, suppression of urine, and other conditions. The appliances needed are a graduated infusion bottle or a fountain syringe, a large-sized aspirating needle, and sterile *normal saline solution* at a temperature of 105° to 110° Fahrenheit. In the absence of an infusion apparatus (Fig. 160) or fountain syringe a large funnel may be used; a piece of glass tubing inserted in the length of the rubber tubing will enable the operator to observe the flow of the infusion. All the appliances must be clean and freshly sterilized by boiling.

The bottle or other container is held at a height of about three feet above the patient's body, and while the solution is flowing from the needle it is thrust quickly into the subcutaneous tissues and held there

The site selected is usually the loose tissues under the breast. The hands of the operator and the site of the operation are carefully disinfected in the usual manner.

The amount injected is usually one or two pints distributed in two or three places; it will require about half an hour for the fluid to enter and during this time the temperature of the solution must be maintained.

After the withdrawal of the needle the skin of the puncture is pinched up, dried with a gauze sponge, and dabbed with collodion. A small gauze dressing is then applied.

Rectal continuous saline infusions by the drop method have replaced to a large extent the subcutaneous infusions. Any ordinary irrigating apparatus may be used with a special nozzle and cut-off.

Intravenous saline infusions are done when quick action is required.

The median basilic or median cephalic vein at the bend of the elbow is located and a properly gauged needle may be inserted direct, or the vein may be exposed and opened, and a cannula tied in. The danger is the introduction of air or any foreign body into the vein, which might cause embolism or death.

Intravenous injections of *neoarsphenamine* for syphilis are given in the same way as saline infusions, with the use of a needle instead of a cannula. The injection tube and needle should be filled with salt solution before the prepared solution is poured into the reservoir, so that salt solution only will escape into the tissues if the vein is missed on the first trial. In most cases it is unnecessary to expose a vein by incision.

Injections of antitoxin for diphtheria are usually given between the shoulders; the procedure is the same as for hypodermic injections, the syringe used being of the same type, only much larger. The usual antiseptic precautions are observed.

Syphilis is now usually treated by intravenous injections of *neoarsphenamine.* Mercury is often used in conjunction with it and preferably by subcutaneous injections of *metallic mercury* in the form of "gray oil." The appliances needed are a hypodermic syringe with a large caliber needle, the gray oil, an alcohol lamp, and collodion, or adhesive plaster.

The injections are usually made in a vertical line on either side of the spinal column and about an inch and a half from it and an inch and a half apart. The syringe used should preferably be of a half or one Cc. capacity, and graduated in fiftieths of a cubic centimeter.

The needles should screw on, as friction needles are forced off by the pressure necessary to push out the thick preparation of mercury. After the preliminary sterilization the syringe and needles are kept immersed in a wide-mouth bottle of liquid petrolatum. The gray oil is kept in a wide-mouth bottle of about fifteen Cc. capacity, and the bottle is protected from dust and dirt in a tin box; the box is kept in a cool place, preferably on ice.

The skin of the patient and the hands of the operator having been disinfected, the gray oil is warmed over the alcohol lamp until it will just flow freely, and then drawn into the syringe. The syringe is next turned point up, and the piston compressed until a drop of gray oil emerges; the set-screw of the piston rod is so placed that the syringe can only deliver the required dose, usually 0.05 Cc; a fold of skin is pinched up vertically between the thumb and finger, the needle plunged in obliquely and the dose is given. The puncture is compressed by the finger for a moment and then sealed with collodion or adhesive plaster. No rubbing of the spot is necessary or desirable. A ten-percent suspension of basic salicylate of mercury in liquid petrolatum is frequently used instead of gray oil.

Puncture Procedures. *Acupuncture* is the process of puncturing the skin and cellular tissues with hypodermic or other needles for the relief of oedema.

The skin and needles are sterilized, and the former protected with gauze while the fluid is draining.

Aspiration consists in the withdrawal of fluid from a cavity, which may be the abdomen, thorax, or pericardium.

Aspiration of the abdomen or *paracentesis* is usually done with a trocar and cannula; after preparation as for any surgical operation, make a small incision in the skin and insert the trocar and cannula.

Aspiration of the chest is required by an accumulation of serum therein known as *hydrothorax,* or if purulent, *empyema;* it is done with an aspirator. Empyema requires major surgery.

For *aspiration of the pericardium* an exploring syringe or hypodermic is used.

Lumbar puncture is done for purposes of diagnosis or to relieve pressure in the spinal canal. The patient is brought to the edge of the bed with his knees well drawn up, and his head and shoulders well bent forward to separate the vertebrae. The puncture is usually made between the fourth and fifth lumbar vertebrae.

Blood specimens are frequently required for 1. microscopical examination; 2. haemoglobin estimates; 3. cell counts; 4. cultures; 5. blood chemistry, Wassermann tests, etc.

For 1 and 2 a drop is taken from a needle puncture of the lobe of the ear; for microscopical examination it is collected on a clean cover glass.

For counts the blood is also taken from the ear-lobe, but with a special instrument known as the haemocytometer.

For blood cultures etc., 10 Cc., or more must be taken from the median basilic vein at the bend of the elbow. After the usual surgical precautions, a ligature is bound about the arm above the elbow tight enough to cause the veins to swell up, but not tight enough to stop the pulse; the hypodermic needle is then pushed directly into the vein. When taking

Fig. 161.—Stomach Tube.

blood with just the needle as a tap, permitting it to flow drop by drop into a suitable receptacle, have the patient alternately close and open his hand firmly; this will facilitate the flow.

Stomach Tube. The *stomach tube* (Fig. 161) is used to remove poisons from the stomach, to wash it out, and to introduce food-gavage.

For the first-named purpose a tube about five feet long is required, for the last purpose one two and a half feet long will suffice. The tube is usually lengthened by a piece of rubber tubing connected by a glass tube.

The patient sits in a chair with his head thrown back; the tube having been warmed and dipped in glycerin is passed, together with the operator's left forefinger, into the back of the throat; the finger guides the tube past the epiglottis to the back of the pharynx, whence it is pushed slowly and gently into the stomach, its passage being aided by attempts to swallow.

Sometimes the patient prefers to take the tube into his mouth, swallow the end and then push it down himself.

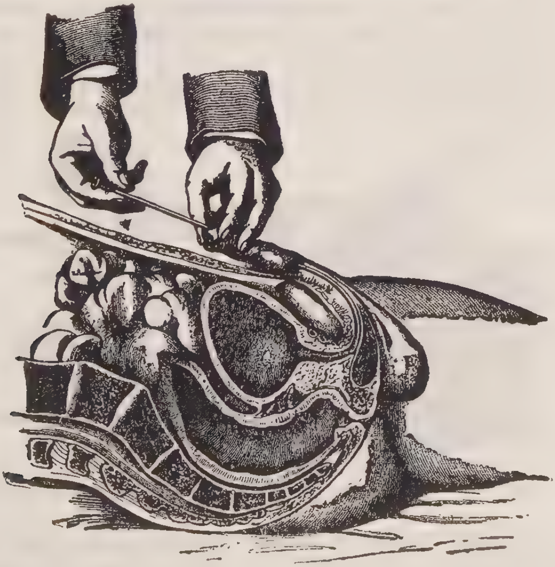


FIG. 162.—Introduction of Metallic Catheter. First step.

Food is introduced through a funnel in the end of the tube. To remove poisons or wash out the stomach, siphonage must be secured; to do this pour water into the funnel held above the patient's head until the tube and funnel are full; then before all the water has run out of the funnel lower it below the level of the stomach; this movement may be repeated as often as necessary.

When the patient is unconscious the operator must be sure before he introduces any fluid that the tube has not entered the patient's larynx.

Sometimes it is desired to obtain a sample of the stomach contents without admixture with water. To do this, introduce the stomach tube in the manner just described, lower the funnel over the basin, have the patient lean forward and strain a little, then gently press the stomach to express the contents.

In *forced feeding,* when the patient resists, it is better to pass a smaller tube along the floor of the nose and thence into the pharynx.

Passing a Sound. *To introduce a metallic catheter or sound into the bladder,* place the patient on his back with the shoulders raised, and the legs drawn up and rotated slightly outward so as to relax the abdominal muscles; having sterilized, warmed, and lubricated the instrument, stand on the left side of the patient, grasp the penis in the fingers of the left hand and draw it vertically upward with its back toward the abdomen, hold the catheter lightly in the right hand and introduce the tip into the meatus. The instrument and penis should now be carried close to the body over and parallel with the groin (Fig. 162).

The penis is then drawn up over the instrument which is at the same time pushed gently in or allowed to pass by its own weight; at the same time the handle of the catheter is slowly carried toward the median line and, after about four or five inches have disappeared in the urethra, elevate to the vertical position, when, the tip passing under the arch of the pubis, the handle is depressed between the thighs (Fig. 163). No force should be used under any circumstances.

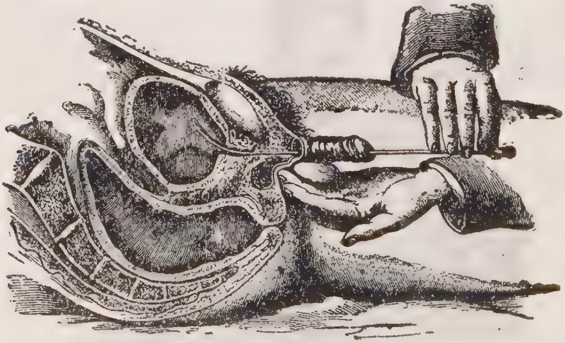


Fig. 163.—Introduction of Metallic Catheter. Second step.

Reducing a Hernia. *Hernia* or *rupture* is a condition in which some part of the contents of the abdomen, particularly the intestine, escapes and forms an external tumor. It is usually caused by violent muscular effort or straining, and is especially apt to occur in the tropics as a result of loss of flesh and general muscular relaxation. Though it develops gradually, its appearance is often sudden.

Inguinal hernia appears as a swelling just above the fold of the groin, which may pass on down alongside the testicle, becoming *scrotal.*

In *femoral hernia* the swelling is just below the fold of the groin, and usually much smaller than in the inguinal form.

The swelling is soft and elastic and at first goes back when the patient lies down, or can be pushed back; sometimes it will not go back and is then said to be *irreducible;* if the hernia becomes so tightly caught in the ring through which it passes that the circulation is arrested it is said to be *strangulated.*

The temporary treatment of a hernia consists in the application of a truss. Before the truss is applied, however, the hernia must be put back or *reduced;* if this is not done the truss will press on the delicate intestine and cause severe pain and inflammation.

To reduce a hernia that will not go back of itself, place the patient on his back with a pillow under his hips, and the hips and knees flexed, and tell him to breath quietly through the mouth, and not to strain. Then grasp the tumor with the fingers and squeeze it gently as you would a sponge, in a direction upward, backward, and outward; a sudden slip will be felt as the intestine returns. The truss should now be applied with the patient lying down. Sometimes it is necessary to immerse the patient's body in a very hot bath before the necessary relaxation of the muscles around the hernial sac can be obtained and reduction effected.

A *truss* consists of a pad to cover the ring and inguinal canal, and a spring to make the pressure and hold the pad in place; there is usually also a strap from the end of the spring back to the pad and sometimes also a perineal strap for additional security in large hernias. After a truss is adjusted, its efficiency should be tested by seeing whether it will hold in the hernia when the patient stands, sits, lies down, bends over, descends stairs, etc.

To measure for a truss place the end of the tape over the point where the hernia escapes, and carry it around the pelvis midway between the anterior superior spine of the ilium and the great trochanter, and back to the starting point.

Electric Batteries. Two kinds of portable *electric batteries* are usually furnished in the army medical department; a *galvanic* or *continuous-current battery,* and a *faradic* or *interrupted-current* apparatus; sometimes the two are combined.

To care for batteries properly it is necessary that their mechanism should be studied. After use the elements or poles should always be lifted out of the liquid, and care should be taken not to spill the liquid in handling.

With dry-cell batteries it is only necessary to see that the circuit is open when the battery is not in use, but electrodes should be dried or wrapped in some protective before they are put away, lest they cause swelling of the box or rusting of the connections.

The essential parts of a galvanic battery are the *cells* which contain the liquid, the *elements* which dip into the liquid, the *cords* which conduct the electricity, and the *electrodes,* usually covered with sponges, through which the electricity is applied; faradic batteries have in addition a *coil* and an *interrupter.*

The sponges should be well moistened with water before use.

To exercise muscles in paralysis the faradic current is usually given about ten minutes at a time. One of the moistened sponges is placed at any part of the limb and the other is moved about with a massaging motion; the skin also should be well moistened.

The galvanic current is given as directed by the surgeon.

Adhesive Plaster, Straps and Strapping. As many of the uses of adhesive plaster are so important, it is thought best to devote space in minor surgery to a detailed consideration of its various applications.

In Splinting. *To hold extemporized splints in place,* especially in the upper extremity, it is much superior to bandages, as it allows the fractured parts to be seen; for this purpose two or three strips about an inch wide are used, and applied as shown in Fig. 164.

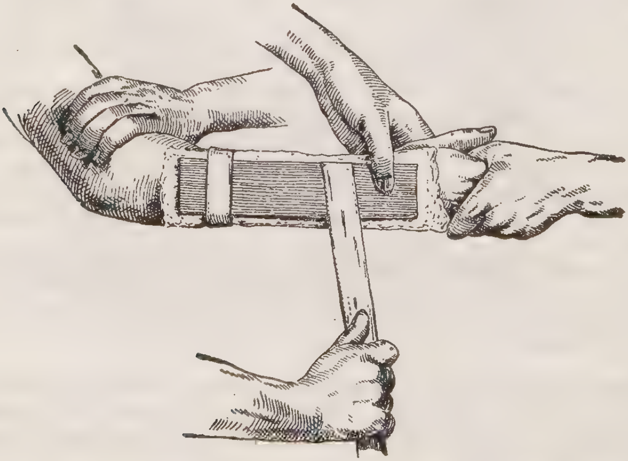


FIG. 164.—Application of Adhesive-Plaster Strips to Retain Splints.

In the lower extremity webbing straps with buckles are better than adhesive straps to hold the splints in position but the adhesive plaster is used in hospital (not field) treatment for purposes of *extension in fractures of the thigh.* For this purpose there should be provided two strips of plaster, each two inches wide and long enough to reach from the seat of the fracture to the malleolus; to each strip is sewed a webbing strap of the same width as the plaster and six inches long; three strips, each an inch and a half wide and long enough to encircle the limb, just above the malleoli, just above the knee, and just below the fracture respectively; and two strips an inch and a half wide, and long enough to encircle the limb spirally from just above the malleoli to just below the fracture. After the limb has been washed, shaved, and dried, the first two straps are applied to the middle of each side of the limb from just below the fracture to the malleoli; then the last two straps are applied spirally in opposite directions to keep the first from slipping, and lastly, the three remaining straps are applied in a circular manner as indicated (Fig. 165). A bandage is applied over all.

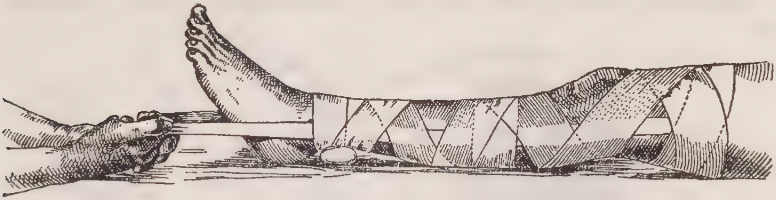


Fig. 165.—Strapping for Extension in Fracture of the Thigh.

A spreader of wood, about two inches wide and sufficiently long to clear the malleoli, is attached to the webbing straps; the spreader has a hole in the middle through which passes a cord which plays over a pulley; to the outer end of the cord is attached a weight.

In Fracture of Ribs. In *fractures of the ribs* a broad swathe of plaster is used, wide enough to extend about six inches on each side of the fracture and long enough to reach three-fourths of the distance around the chest. (Fig. 166).

The patient standing or sitting, with his hands on top of his head, one end of the swathe is fastened just over the spinal column; with the other end in his hands the surgeon walks around the patient applying the swathe smoothly and very firmly. Or strips of plaster about four inches wide may be used, each strip overlapping the previous one about one-third.

In Fracture of Collar-bone. *In fracture of the clavicle a Sayre dressing* (Fig. 167) is especially useful in the field and preferred by some surgeons in lieu of other methods of splinting. Prepare three strips of plaster, each three or four inches wide and long enough to go one and one-half times around the body. Encircle the upper arm just above the middle with a strip of bandage wider than the plaster; place a folded towel in the axilla, and a couple of layers of gauze sprinkled with talcum wherever the skin surfaces would come in contact. Pin a loop of one of the plaster strips, sticky side out, around the upper arm over the bandage; then, while an assistant holds the shoulders back, carry the other end of the strip across the back, under the sound axilla, and over the front of the chest back to the starting point. Now place the hand of the injured side on the sound shoulder; take the second strip and, starting at the back of the sound shoulder, carry it obliquely across the back, under the elbow of the injured side, supporting it, and up over the injured forearm and hand to the starting point.

The third strip is carried circularly around the body holding the arm to the side.

Where the second strip crosses the elbow a slit should be made in the strip to secure the elbow, which must here be protected from cutting by the edges of the plaster with a little cotton batting. Over the whole a Velpeau bandage may be applied.

Strapping a sprained ankle has already been fully described, in Chapter XV.

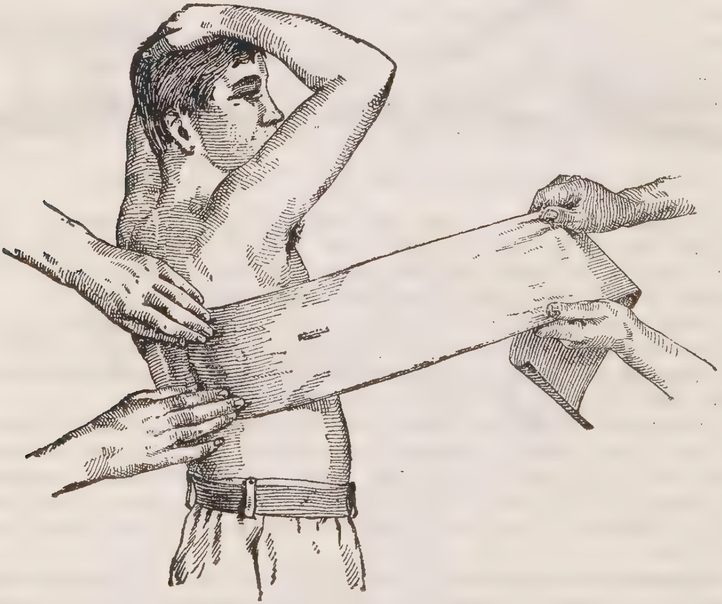


Fig. 166.—Strapping of Chest for Fractured Ribs.

In Swollen Testicle. A swollen testicle, after the acute inflammation has subsided, is best treated by strapping. The straps should be a half-inch wide and ten or twelve inches long; the operator isolates the affected testicle in the scrotum by encircling its upper part with the thumb and index fingers of the left hand, and replacing the encircling fingers with a strap of plaster. He then covers the testicle with a series of recurrent strips and reënforces the latter by circular strips (Fig. 168).

In Wounds. *To bring the edges of a wound together* in the absence of sutures, straps of plaster one-fourth to one-half an inch wide may be used. As the plaster is not aseptic the wound itself must be protected from contact with the plaster by a narrow strip of sterile gauze.

To remove plaster straps from a wound, both ends of the strap must be detached simultaneously so as not to tear apart the edges of the wound.

When a good deal of plaster has to be removed, especially if the part is hairy, a little ether or alcohol should be dropped under the edges of the plaster as it is raised; this will cause it to come away without any pulling. Any remaining plaster may be washed off with ether or alcohol, and the skin then dusted with talcum.

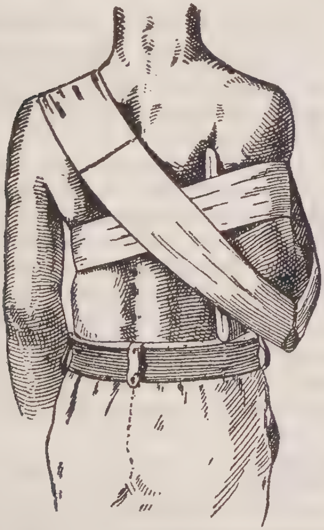


FIG. 167.—Sayre's Strapping for Fracture of Collar-bone. Back view.

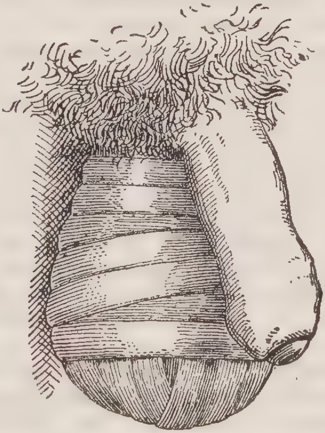


FIG. 168.—Strapping the Testicle.

Dental Emergencies. In the absence of a dental officer, medical soldiers, especially old and experienced noncommissioned officers, are frequently intrusted by the surgeon with the treatment of some of the most common emergencies of a dental character. Such emergency treatment as the medical soldier may be able to render will often alleviate pain so that the sufferer may continue with his duties or, if at night, be assured of rest. Such treatment is necessarily of a temporary nature and usually is intended only to keep the patient comfortable, until the services of a dental officer become available. The simple instructions given below will prove beneficial in coping with such routine emergencies as may arise.

Below is a brief outline of the outstanding symptoms, and of the appropriate emergency treatment for the dental diseases and injuries which are the most prevalent. These affections are: Dental Caries, Pulpitis, Abscesses, Periodontoclasia (Pyorrhea), Gingivitis, and Stomatitis.

Caries. *Dental Caries* is commonly caused by food lodging around the teeth and being permitted to remain there long enough to ferment and decompose. As a result of this decomposition, an acid is produced which attacks the enamel of the tooth and destroys it. Once a break occurs in the enamel, additional food lodges in that area and the ravages of decay progress. The patient experiences infrequent discomfort in certain areas, especially during eating, and complains of food packing between the teeth, causing annoyance until removed.

Since the principal factor connected with all caries is the probable presence of acid forming bacteria in the débris around the teeth, and in the actual cavities, the *initial* step in its treatment should be to place the mouth in the best possible condition by having the patient thoroughly brush his teeth, removing all loose deposits of food, after which the mouth should be rinsed thoroughly with salt water.

Then remove loose particles of debris and soft decay from the cavity. Mix a thick paste of Eugenol or Oil of Cloves, and Zinc Oxide powder, to a consistency of putty. Isolate the affected area with a roll of gauze, or cotton, and wipe out the cavity with a pellet of cotton moistened in alcohol. Follow this with a pellet of cotton to dry the cavity, and apply the Zinc Oxide paste. Remove excess paste and instruct patient to avoid use of the tooth for a couple of hours. If Zinc Oxide is not available, pack a small pellet of cotton, saturated with Eugenol, loosely into the cavity. Phenol may be employed instead of Eugenol, in very small quantities, if care is exercised to avoid a burn. Surrounding areas should be wiped off with cotton dipped in alcohol, following the application of phenol.

Pulpitis. Commonly known as "Tooth-ache," this affection is caused by the pulp (nerve) of the tooth becoming irritated by the invasion of bacteria from the cavity in the tooth, which brings about a hyperemia (excess of blood) in the pulp chamber, with resultant congestion and pain.

In acute pulpitis there is severe throbbing pain, sensitive to both heat and cold, especially the latter. There is no perceptible swelling of the soft tissues. The treatment is the same as outlined above for Dental Caries.

Chronic pulpitis is more indefinite in its symptoms and more difficult to locate. It is often caused by an artificial *crown* or *filling* becoming slightly loosened and decay taking place beneath it, or some mechanical irritation existing around a tooth. The pain is increased by the application of hot or cold water. There is no perceptible swelling of the soft tissues. The patient complains of neuralgia. To treat properly a condition of this kind will very often entail the removal of a filling or a crown, and great care should be exercised to locate the proper tooth before any treatment is attempted. The treatment after the removal of the cause is the same as for dental caries.

Abscesses. *Dento-alveolar Abscess* is caused by the pulp (nerve) of a tooth becoming devitalized (dying) as a result of decay or through some injury. Bacteria from the infected pulp extend through the apices (ends) of the roots into the soft tissues and bony socket, causing severe irritation and subsequent infection of those tissues.

Dento-alveolar abscesses are of two classes, acute and chronic.

The symptoms of the acute type are very pronounced. Patient complains of severe pain in the tooth. In the early stages no swelling will be apparent, while in the later stages the surrounding soft tissues are markedly swollen. To distinguish it from pulpitis in the early stages, apply cold water. While the application of cold water increases the pain in pulpitis, it does not do so in abscessed conditions, but often reduces the pain. Pain is markedly increased when pressure is applied to the affected tooth. Often times the teeth on either side of the affected tooth are slightly sensitive to pressure.

In treatment, locate the tooth which is most sensitive to pressure. It, in all probability, will have a large cavity. Carefully clean out food débris and soft decay, and excavate until a good opening is made into the pulp chamber. In these cases, the pulp is usually nonvital and an offensive odor will be noticed. Pus may discharge from the opening made into the pulp chamber. Have the patient wash his mouth thoroughly with salt water and by closing his mouth and producing suction draw as much pus as possible from the tooth. This usually relieves the acute pain. If pus has accumulated in the surrounding "gums," the latter will appear swollen and fluctuate on pressure applied by the finger. In such complications, with a bistoury a puncture should be made straight downward at the base of the gum and over the softest spot; thus liberating the pus. After-treatment consists in keeping the mouth clean (washes, etc.), the application of an ice pack to the affected side of the face (patient sitting up), the administration of acetylsalicylic acid (aspirin) until severe pain is relieved, and a cathartic.

Chronic Dento-alveolar Abscesses have fistulous openings on the surface of the gum tissue and very rarely cause sufficient trouble to require emergency treatment. They sometimes develop acute symptoms and in that event, should be given the treatment just outlined. Extraction is the only positive remedy for a tooth in this condition and in the absence of a dental or medical officer this work should be undertaken only in extreme emergencies and as a last resort. (See Extraction.)

Partially erupted and impacted teeth often develop acute symptoms caused by inflammation of the tissue overlying the tooth. This may be accompanied by swelling and a moderately severe trismus (difficulty in opening the mouth).

Palliative treatment consists in frequent use of a hot mouth wash of salt water, and painting overlying gum tissues with a solution of equal parts of tincture of Aconite and tincture of Iodine, followed by an ice cap on the affected side of the face.

Periodontoclasia (Pyorrhea). Patients appearing for emergency treatment of this affection will usually have a general inflamed condition of the gums. This is accompanied by swelling, a tendency to bleed easily, and to discharge pus on application of gentle pressure. The acute condition is usually due to stoppage of free drainage of pus, with resulting accumulation and tension.

In treatment, cleanse the mouth and instruct patient regarding subsequent daily hygiene, press out as much pus as possible by massaging, paint affected area with aconite and iodine, and refer patient to a dental officer at the first opportunity.

Gingivitis. In this affection the gums bleed easily; they are slightly swollen, dark red in color and very tender to pressure. This condition frequently accompanies a lack of proper mouth hygiene and the accumulation of salivary calculus (tartar). These accumulations are frequently up under the gum and not visible on casual examination.

In general the treatment is the same as for pyorrhea.

Vincent's Stomatitis. This disease, commonly alluded to as "Trench mouth," almost invariably attacks the gingival margin of the gums at the necks of the teeth, but cheeks, tonsils and other soft tissues of the mouth may also be inflamed and ulcers appear. It is believed to be caused by a specific organism, and requires more care than simple gingivitis.

The gingival margins present a ragged ulcerated appearance, are painful to the touch and bleed easily. The patient has a foul breath and usually gives a history of sleepless nights and inability to masticate food on account of extreme pain. An extremely pessimistic mental attitude on the part of the patient in regard to his condition is so common as to be almost a characteristic of the disease.

In the absence of a dental officer, a medical officer usually takes charge of and personally directs the treatment to be employed in these persistent and painful cases. In the absence of either, the following treatment, found to be most satisfactory, can be given.

Have the patient use every two hours while awake a mouth wash consisting of:

Glycerini	20 c. c.
Liquoris Potassii Arsenitis	10 c. c.
Aquæ Hydrogeni Dioxidi	120 c. c.
Aquæ Destillatæ	100 c. c.

It is essential that the wash be retained in the mouth for at least three minutes at each application. The retention of the medicament in contact with the diseased tissues for this period of time is of prime importance in securing the full benefits of its therapeutic effect. As soon as the acute symptoms have subsided the mouth wash may be reduced to use morning and evening, for at least one month.

In lieu of the above, good results have been achieved by the use of a mouth wash made up of equal parts of full strength peroxide and 1-1000 bichloride, used four or five times daily. As corrosive sublimate is highly poisonous, the patient should be cautioned to exercise special care in using and keeping it, especially under conditions where it might be taken in mistake for some common household remedy.

As Vincent's Stomatitis is communicable, the patient should also be instructed to use only his own mess and drinking utensils, in order to avoid the infection of others. He should be placed under the observation of a dental surgeon as soon as one becomes available.

Extraction of Teeth. Occasionally a tooth may be found in such condition that its removal seems imperative. In the absence of a dental officer this operation should be attempted only as a last resort. When all other attempts to alleviate the pain have proven unsuccessful, or the tooth is very loose and painful, extraction may be undertaken. If undertaken by a medical soldier it should be understood that he is attempting a form of surgery, and all instruments and his hands *must be scrupulously clean,* or serious infections may result.

Extraction of teeth does not depend on the strength of the operator, but lies in the application of force in a definite manner so as to loosen the attachment of the tooth from its investing tissues. Teeth cannot be "pulled" out with a straight pull.

Procedure: 1. Thoroughly wash out the patient's mouth with salt water.

2. Examine the tooth carefully so as to have an idea of the amount of crown that can be grasped with the forceps.

3. Paint tincture of iodine about the neck of the tooth and adjacent tissue, but use it sparingly.

4. Select forceps which will approximately fit the tooth. Upper forceps are usually straight or bayonet-shaped.

5. Apply the beaks of the forceps to the crown and press as far as possible up under the gum, before applying a pulling force to remove the tooth.

6. Take a firm grip on the forcep handles and rock the tooth slowly back and forth, towards the cheek and then towards the tongue or palate, at the same time slowly lifting it from its socket.

Caution. Do not attempt to extract teeth that are so badly decayed as can be readily seen will break off if forceps are applied. An attempt of this sort will result in failure and leave the patient in a worse condition than before.

Hemorrhage. Sometimes profuse bleeding follows the extraction of teeth. This may occur many hours after the operation. The ideal and most efficient method of arresting this hemorrhage is the use of pressure.

Wash out the mouth with cold water, then locate the *exact point* from which the blood is coming. Make a pack of sterile folded gauze which will more than cover this point. Apply this to the area with pressure. Follow this first piece with enough additional gauze, similarly prepared, to obtain considerable pressure on the entire bleeding area, by closure of the jaws, whether teeth are present or not. Instruct the patient to keep a steady pressure on this pack for one-half hour, by supporting his jaw with his hand. If hemorrhage has entirely stopped by that time, remove all the gauze *except* the piece first applied. If oozing continues, have the patient repeat the pressure for a longer period of time.

Post-Operative Pain. 1. Have the patient wash out mouth with hot salt water, using more salt than the water will dissolve so there is some remaining in the bottom of the glass.

2. Apply ice cap or cold cloths to painful area of face.

3. Have patient raise his head higher than rest of body.

4. Apply some powdered acetylsalicylic acid (aspirin) directly to the painful socket or area.

5. Give a cathartic.

CHAPTER XIX

MESS MANAGEMENT, FOODS, AND COOKING

Introduction. The management and general administration of a hospital mess is one of the most important duties devolving upon enlisted men of the Medical Department, as upon the success of the mess depends not only the welfare of the patients but much of the contentment and happiness of the men themselves. In the smaller hospitals only one mess can be maintained for both patients and duty personnel. Economy necessitates such practice. On the other hand, in the larger hospitals it is frequently necessary to establish four or five different messes in order to care properly for the classes of patients and duty personnel being subsisted. (See paragraph on "The Mess," in Chapter XVI).

The Mess Sergeant. The noncommissioned officer selected for this assignment must be not only a man of intelligence and business capacity, but also one who has had actual experience in the kitchen and is well grounded in the principles of cooking. He is in immediate charge of the mess and directly responsible to his commander for its efficient management. He draws or purchases all rations and other supplies required for the mess, prepares all bills of fare, and keeps a daily statement showing the exact financial condition of the mess. He is directly responsible that only sound products are accepted and for the care and preservation of the supplies on hand. He is also responsible for keeping a careful check on all property utilized in the mess, the neat and clean appearance of personnel on duty in the mess, the promptness with which they report at their places of duty, the orderly conduct of all those present at meals, and the proper preparation and serving of meals.

The Cook. Cooks work under the direct orders and supervision of the mess sergeant. During the service of the meal cooks on duty remain in the kitchen and serve the food to the waiters. Personal cleanliness on the part of a cook is of the greatest importance. He should bathe and have a change of clean clothing daily. White uniforms, skull caps and aprons are provided for him. He must always be orderly in and about his kitchen, keeping it and his utensils scrupulously clean. It is important to have a place for each utensil and to keep it there, clean, ready for use when required.

The cook assists the mess sergeant in drawing up the bill of fare. Their success depends largely upon their ability to estimate correctly, or better still, figure correctly the kinds, quantities and cost of the supplies which will be required in the preparation of any meal. The "income" of the mess must be constantly borne in mind; otherwise an embarrassing "deficit" of funds is almost certain to accrue. After the bill of fare for the day is made, the cook will save himself much time and labor by carefully reading it over and formulating a plan of the details necessary to put it into effect.

Food and its Constituents. For ordinary purposes food may be regarded as anything which, taken into the body, is capable of supplying material for growth and the repair of waste, or of furnishing energy for bodily heat and work.

The principal constituents of food are proteins, carbohydrates, fats, water, and certain mineral substances.

In addition, all fresh animal and vegetable foods contain small traces of substances known as *vitamines.*

Most of the food substances require to be digested by the digestive juices before they can be absorbed and made use of in the body. These changes take place in the alimentary canal. (See Chapter XI).

Proteins. The proteins are complicated nitrogenous substances, and are the only food substances which can build up and repair tissues; they are therefore essential constituents of all dietaries.

Meat consists mainly of proteins; they are also present in other tissues of all animals, and in vegetables, but vegetable protein is of less value to the body than an equal amount of animal protein.

In addition to building up and repairing the tissues, the protein metabolized in the body yields a small amount of energy.

Carbohydrates and Fats. The chief carbohydrates in foods are starches and sugars. During digestion the starches are converted into sugar (glucose) and absorbed as such. Fats are derived both from animal sources (the fat of meat, lard, butter, etc.) and from vegetable sources (oleomargarine, salad oil, etc.). Oils are liquid fats and are usually of vegetable origin.

The carbohydrates and fats are the chief sources from which the body obtains the energy required for work and the production and maintenance of the body's heat, and a diet containing too much carbohydrate or fat leads to the storage of fat in the body. A small amount of stored fat is beneficial because it forms a reserve of material which can yield energy.

Vitamines. Practically all fresh foods contain small traces of substances which are essential for the maintenance of health and for the production of growth. In their absence, growth may cease, the repair of wounds may be interrupted, or certain diseases, such as scurvy and beri-beri, may arise. These substances are called vitamines; they are destroyed by prolonged cooking and by certain chemicals such as bicarbonate of soda, which is sometimes used in cooking green vegetables to retain their color.

A diet composed only of preserved meats and dried vegetables infallibly leads, in the course of a few months, to disorders of nutrition.

The cream of milk contains a large proportion of the particular vitamine which is necessary for the growth of the body; hence its vital importance for the nourishment of children.

Mineral Substances. Mineral salts are essential to health. Common salt, being required in large quantities, is added to the food, but the other salts of the body, such as those of calcium, iron, sodium, potassium, and phosphorus, are obtained in sufficient quantity from the material forming an ordinary diet.

Water. Water serves for the solution and conveyance of food to the various parts of the body, and also for the excretion of useless products. It is not received into the body solely as a liquid, but forms a large proportion of the solids taken.

Food Values. Except in the growing animal, in those who are putting on weight, and during convalescence, nearly the whole of the food absorbed is oxidized in the body, i.e., it is burnt at a very slow rate. In this process of oxidation, energy is produced, most of it in the form of heat, which serves to keep the body warm, while the remainder supplies energy for muscular movements and other functions of the body. In the growing animal and in convalescence from any disease which has caused loss of weight, part of the food stored in the body is used to form new tissues or to replace those lost.

The energy value of different foods can be ascertained by estimating the amount of heat produced when a definite amount of the substance is completely burnt or oxidized. The unit for measuring this heat is termed a *calorie,* and is the amount of heat required to raise one kilogramme of water one degree Centigrade, or, roughly, four pounds of water one degree Fahrenheit. Although this estimation of food values is a useful guide in drawing up dietaries, the results cannot be rigidly applied to human food, as, for a variety of reasons, man is not able to extract the full energy value of the food.

The energy values of the three chief constituents of food are, in round figures, as follows:

Carbohydrates	4 calories per gramme.
Fats	9 " " "
Proteins	4 " " "

If, then, we know the composition of a food, its approximate food value is easily reckoned from the above figures.

For example, one pint of fresh milk contains approximately 400 calories.

Food Requirements. A certain quantity of food is required to furnish energy for "*internal work*" of the body, i. e., the heart's work, respiration, etc.; the maintenance of body warmth; the renewal of tissues. This quantity of energy, which may be taken as 1,680 calories daily, must be supplied to keep the body *alive* quite apart from the performance of any visible work.

A further supply of food is required to provide energy for *"external work"*, and this quantity depends largely on the amount of work done. The human body can convert about one quarter of the total energy value of the food into energy available for work. The ordinary work of a soldier, (drills, technical work, &c.,) requires from 300 to 400 calories of energy; his food must, therefore, contain four times this number of calories, i. e., 1,200 to 1,600, in order to furnish the energy required for external work; to this must be added the 1,680 calories required for internal work of the body. Thus, in peace time the ration should contain *at least* 3,600 calories, while on maneuvers or active service it should furnish *over* 4,000 calories. This calculation is based on the work done, but several other factors also influence the quantity of food required. Thus, a big man requires more food to replace tissue waste and loss of body heat; a cold climate or insufficient clothing leads to rapid loss of heat from the body, to replace which the supply of food, especially fatty food, should be increased. In a warm climate the escape of heat is facilitated by reducing the clothing, so that, as the work is much the same, the amount of food taken remains nearly the same. The garrison and field ration of the Army is capable of furnishing a maximum of 6,000 calories.

Characteristics of Fresh Food. *Beef.* A healthy carcass of well-fed beef has externally a round well-filled appearance. The muscle or flesh should be soft and silky to the touch, full of juice and of a slatey color, but a freshly cut joint changes color in a few minutes to a bright cherry red as the result of exposure to the atmosphere. The flesh should be elastic under slight finger pressure, and free from any tendency to "pit"; moist without being wet and well mottled or marbled with fat.

In an old cow, there will be a total absence of marbling, and the lean will be harsh and stringy to the touch, duller in appearance and deficient in juice, and there will generally be little fat. In an old bull, the flesh is dark in color, feels like india-rubber, marbling is absent and there is a much greater proportion of muscle than fat. The color of the fat varies from cream or pale straw to bright yellow. It should be well set.

Mutton. The fat in good well-fed mutton should be firm and white and fairly abundant. A common complaint is that it is too fat, but good mutton is unobtainable without a fairly high proportion of fat. The muscle should be red, soft and silky to the touch, moist without being wet and slightly elastic under the pressure of the finger. There is sometimes a little marbling, but it is rare.

Bacon. The lean parts should be of a pale pink color (if very red, it denotes a high percentage of salt), the fat white and firm to the touch, the rind thin. Bacon is tested by inserting a skewer or knife into the fleshy parts of the meat and smelling the blade when withdrawn. There should be no unpleasant odor.

Fish. When fish are *fresh* the eyes should be prominent and bright, the gills bright red in color, flesh firm and stiff. When pressed with the finger it should not pit and there should be no unpleasant smell. All fish when delivered should be clean, unbruised and unbroken. A pinkish color along the back bone of white fish is a sign of staleness.

When *cured* the fish should present a wholesome shiny appearance. Should there be any doubt regarding its freshness, an incision should be made in the thick part of the flesh near the back bone; if there is any unpleasant smell the fish must be rejected.

Poultry. Fowls ought to be young, fresh, in good condition and weigh about 1½ lbs. when drawn and dressed. Signs of age are shown by stiff horny feet, long spurs, dark-colored hairy thighs, stiff beak and bones.

There should be no smell or discoloration of the skin. The back generally discolors before the breast. The feet should be limp and pliable, not stiff and dry, which is the sure indication of a stale bird. The condition of the flesh should be firm and not flabby, and the bird should be plump; the breast-bone is sometimes broken across to produce this appearance.

Turkeys should be of medium size, weighing from 10 to 12 lbs. when drawn and dressed. The skin of young birds is soft and smooth, not coarse and irregular as found in older birds. The lower part of the breast bone should be pliable, legs dark in color. Hen turkeys are considered the best for cooking.

Eggs. The average hen's egg weighs about 2 oz. avoirdupois. In order to ascertain the freshness of an egg, hold it up to the light; when the centre appears to be the most transparent part, it is a sign of freshness. Stale eggs are more transparent at the larger end. Stale and small eggs should be rejected. Good eggs should have a characteristic sweet odor and flavor. The yolk should stand up well when the shell is broken. An egg is not considered *fresh* if over two weeks old.

Milk. Cow's milk enters very largely into all dietaries; every care must be taken to use it when fresh, since, owing to the action of germs, lactic acid is formed after some hours, and the milk becomes sour. The cleaner the milk, the longer it will keep fresh and sweet; therefore great care must be taken that the vessels in which it is kept are perfectly clean, and that it is protected from dust (which always contains germs). The cooler the temperature at which it is kept, the longer will the milk remain sweet.

The cream should not fall below 3.5 per cent.; this may be tested by placing the milk in a long glass, marked with graduated divisions, and reading off the amount of cream that has risen after 24 hours; or a strip of paper may be marked in divisions (tenths and hundredths), and gummed to the outside of the glass.

The specific gravity ranges between 1.030 and 1.034 at 60° Fahrenheit.

Good milk should be of a full opaque white, or very slightly yellowish tinge; this is best seen by placing it in a glass on a sheet of white paper. It should have a slight, agreeable odor, and characteristic sweetish taste, without any pronounced taste or smell of any kind.

The chief adulterations are: the addition of water; the removal of part of the cream, with or without the addition of water; the addition of the so-called preservatives, as bicarbonate of soda, borax, boric acid, salicylic acid, or formalin. The addition of water lowers the specific gravity, and generally speaking there is a loss of three degrees for every ten per cent of water added. On the other hand, removing the cream (skimming) raises the specific gravity; so that in milk that has been skimmed and watered the specific gravity may be normal. This test must therefore be used in conjunction with the estimation of the cream present.

Butter. Butter is obtained by churning, either from the milk directly, or from cream that has previously been separated. It should be of a good, rich-yellow color, pleasant and characteristic smell and taste; the taste may be slightly salt, but should not be in the least rancid or bitter. The quantity of added salt varies considerably, but nowadays much less (generally 2 or 3 per cent.) is used than formerly, other preservatives, such as boric acid, being used instead; of this there ought not to be more than 0.5 per cent. Butter which has been insufficiently "worked" will exude drops of milk when pressed and is very likely to go sour.

Vegetables. Fresh vegetables and fruits should not be used if they have become stale. If received in bulk they must be removed as soon as possible from the bags or boxes containing them, and laid out separately on shelves to allow free access of air. This prevents fermentation and decay.

Cereals. Wheat, barley, tapioca, sago, oatmeal, etc., if old or stale, have a greyish dull appearance. The same remarks apply to the manufactured products such as corn meal, flour, ground rice, macaroni, rolled oats, sago, and tapioca.

The skin of lima beans, haricot beans, the common bean, dried peas and lentils presents a shrivelled appearance when they are old.

Canned Foods. The preservation of foods in cans is carried out by heating the food stuffs to a high temperature, 115° to 120° C, and closing the tin so that all air is excluded. The heat kills all germs, and by closing the can while the contents are still hot a partial vacuum is formed in the can when it cools, owing to the contraction of the air. This contraction sucks in the ends of the can, making them slightly concave.

In damaged cans or in cans in which the contents have not been completely sterilized putrefaction may set in with the formation of gas, which bulges out the end of the can. Such a can is said to be "blown" and should be rejected.

The contents of a can containing food should be emptied out of the can as soon as it is opened.

Owing to the heat to which most foods are subjected in process of being canned nearly all vitamines are destroyed.

The Ration. A ration is the allowance of food for the subsistence of one person for one day.

The following kinds of rations are provided:

1 The garrison ration; 2 The Filipino ration; 3 The travel ration; 4 The field ration; 5 The reserve ration.

Garrison Ration. The garrison ration is that prescribed in time of peace for all persons entitled to a ration, except under the specific conditions for which other rations are prescribed, and consists of the following:

Article	Quantity
Meat:[1,2]	
Beef, fresh or frozen[3] oz.	18
Bacon oz.	6
Flour, wheat oz.	18
Baking powder oz.	.08
Dry vegetables:	
Beans oz.	1.2
Rice oz.	.8
Fresh vegetables:[1]	
Potatoes oz.	17
Onions oz.	5
Tomatoes, canned oz.	2
Fruit:	
Prunes oz.	.384
Jam oz.	.64
Apples, evaporated oz.	.128
Peaches, evaporated oz.	.128
Macaroni oz.	.5712
Cheese oz.	.5712
Flavoring extract oz.	.014

Article	Quantity
Beverages:	
Coffee, roasted or roasted and ground oz.	1.5
Tea oz.	.05
Cocoa oz.	.3
Sugar oz.	4
Milk, evaporated, unsweetened oz.	1
Butter:	
Butter oz.	1.75
Oleomargarine oz.	.25
Vinegar gills	.08
Pickles, cucumber gills	.08
Salt oz.	.5712
Pepper, black oz.	.04
Lard:	
Lard oz.	.32
Lard substitute oz.	.32
Sirup gills	.1427
Cinnamon oz.	.014

[1] In Alaska the beef component is increased by 10 per cent, the bacon component by 33 1/3 per cent, and the vegetable component by 20 per cent.

[2] On Thanksgiving Day and on Christmas Day the meat component is as follows:

	ounces
Turkey, drawn	25
Turkey, undrawn	28

[3] Alternate fore and hind quarters.

Filipino Ration. The Filipino ration is that prescribed in time of peace for Philippine Scouts. Its components are prescribed from time to time by the War Department. It consists of the following:

Article	Quantity
Meat:	
Beef, fresh or frozen[1] oz.	9.4
Bacon oz.	1.9
Fish, fresh, canned, salt, or smoked oz.	2.8
Flour, wheat oz.	10
Baking powder (when bake ovens are not available) oz.	.32
Dry vegetables:	
Rice, unpolished oz.	20

Article	Quantity
Fresh vegetables:	
Potatoes oz.	8
Onions oz.	2
Coffee, roasted or roasted and ground oz.	1
Sugar oz.	2
Vinegar gills	.08
Salt oz.	.55
Pepper, black oz.	.02

[1] Alternate fore and hind quarters.

Travel Ration. The travel ration is for troops traveling otherwise than by marching and separated from cooking facilities. It consists of the following:

Article	Quantity
Bread, soft oz.	18
or	
Bread, hard oz.	16
Beef, corned, or hash, corned beef oz.	12
Beans, baked oz.	4

Article	Quantity
Tomatoes, canned oz.	8
Jam oz.	1.4
Coffee, roasted and ground oz.	2
Sugar oz.	4
Milk, evaporated, unsweetened oz.	1

Field Ration. The field ration is that prescribed for all persons entitled to a ration in time of war and whenever the ration-savings privilege is suspended. Its components are prescribed by the War Department or the commander of the field forces and correspond as nearly as practicable with the components of the garrison ration.

Reserve Ration. The reserve ration is for use in campaign when the field ration is not available, and consists of the following:

Article	Quantity	Article	Quantity
Beef, corned ....oz.	7.0	Chocolate, vanilla, sweetened.oz.	3.0
Beans, with pork and plain sauce ....oz.	8.5	Coffee, soluble ....oz.	.6
Bread, hard ....oz.	6.6	Sugar, granulated ....oz.	2.4

The reserve ration is an article of field equipment, and, except in emergencies, is to be opened only by order of a commissioned officer. Organization commanders are responsible for the proper care and use of reserve rations when issued to enlisted men.

Officers and Warrant Officers. In the field during active operations officers and warrant officers, upon their request, may be included by name on ration returns of organizations designated by the commanding officer. The number of rations so obtained are noted on pay accounts for the month in which received and finance officers collect therefor at the commuted value indicated in War Department orders.

Destitute Persons. When it becomes necessary in the opinion of the commanding officer to issue subsistence stores to destitute persons to relieve starvation or extreme suffering, he issues a written order stating fully the circumstances, specifying the kinds and quantities to be issued, and causes the same, with an accompanying certificate showing the actual issues made, to be filed with the voucher to the property account.

Food Equivalents. The following table of food equivalents of component articles of the garrison ration is published for the information and guidance of all concerned in administering messes and arranging a suitable menu:

MEAT COMPONENT
(Beef, fresh, and bacon)

Article	Ounces	Article	Ounces
Beef, fresh	26.4	Bacon	16
Mutton, fresh	26.4	Pork salted or smoked..........	16
Veal, fresh	26.4	Beef, dried or salt	20
Fish:		Liver, beef, fresh	26.4
Fresh	26.4	Sausage, fresh or canned:	
Canned	16	Pork	16
Ham or shoulder	18	Vienna	16
Fish:		Frankfurter	20
Pickled	26.4	Bologna	20
Dried	16	Canned meats	20
Pork, fresh	26.4	Veal loaf	16
Turkey or fowl:		Cheese, full cream	14
Dressed, drawn	25	Tongue, beef, fresh	24
Dressed, undrawn	28		

FLOUR, WHEAT, COMPONENT

Other flours	18	Crackers, assorted	16
Soft bread	18	Macaroni	18
Hard bread	16	Starch, corn	18
Corn meal	20	Tapioca	18
Hominy, fine	16		

BAKING POWDER COMPONENT

Yeast, compressed or dried	0.08

DRIED VEGETABLE COMPONENT

(Beans and rice)

Beans, dry (navy, lima, or kidney	2.4	Beans, baked	4
Rice	1.6	Cereals, breakfast	2.2
Hominy	1.6	Peas, dried	2.4

FRESH VEGETABLE COMPONENT

(Potatoes, onions, and canned tomatoes)

Potatoes, fresh	24	Corn, canned	12
Onions, fresh	24	Beans, lima, canned	21
Other fresh vegetables	24	Other canned vegetables	24
Tomatoes, canned	24	Vegetables, dehydrated	5
Potatoes, canned	19		

FRUIT COMPONENT

(Prunes, jams, evaporated peaches, and apples)

Article	Ounces	Article	Ounces
Fruits, dried or evaporated	1.28	Preserves, assorted	1.28
Fruits, canned	5	Raisins	1.22
Apple butter	1.28	Rhubarb, fresh or canned	12
Currants, dried	1.28	Fruits, fresh	4
Dates, dried	1.08	Jam, assorted	1.28
Figs, dried	1.6		

Ration Return. A ration return is a requisition on the quartermaster for rations, signed and submitted by officers under whom persons entitled thereto are serving.

Ration returns are submitted on the first day of each calendar month for the preceding calendar month and at such other times and for such other periods as may be necessary.

All ration returns are signed and submitted by organization or detachment commanders, or personnel adjutants, to the commanding officer and after approval by him transmitted to the quartermaster, who files them with the proper ration-savings account. These returns may be consolidated should the Commanding officer so direct. Where two or more organizations or detachments are assigned to the same mess, the ration returns from these units are consolidated in the office of the commanding officer and the number of rations computed as for one organization. This return is signed by the personnel adjutant and after approval by the commanding officer is transmitted to the quartermaster. The commanding officer causes all ration returns submitted to him for approval to be checked and satisfies himself that all provisions of Army Regulations have been complied with.

Troops changing station and those detached for duty where subsistence is not furnished by the Quartermaster Corps submit, prior to departure, a ration return for such period in advance as the commanding officer may deem necessary.

Computation of Rations. The following additions and deductions are made on the rations due:

1. To cover any changes that may occur after a ration return has been submitted in advance.
2. For organizations averaging 25 men per day or less, add 10 per cent.
3. For organizations averaging 26 to 75 men per day, add 5 per cent.
4. For organizations averaging 76 to 150 men per day, make no change.

5. For organizations averaging more than 150 men per day, deduct 5 per cent.

6. For individual men authorized by the commanding officer of the post, camp, or station to mess separately, add 10 per cent.

The amount of ration credit due an organization maintaining separate messes for detachments is computed by applying the foregoing provisions for organizations to each mess so maintained.

In special cases where, due to local conditions, the unusually small size of the detachment, or the character of the work upon which the enlisted men are engaged, the additions authorized above are insufficient for the proper subsistence of the men, the Secretary of War is authorized to make such additional increase as may be necessary, provided the total allowance thus authorized shall be less than the monetary allowance prescribed for subsistence for enlisted men when rations in kind are not furnished and Government messing facilities are provided.

Ration and Savings Account. A ration and savings account is a voucher prepared by the quartermaster upon which is computed the value of the ration and indicated thereon for each organization, the period covered, number of rations due, amount of credit due, value of stores purchased, and the balance due the organization or the United States, as the case may be.

Money Value of the Ration. On the 1st of the month, or whenever necessary, the quartermaster computes the money value of the ration in use at his station at the current prices of his components and communicates it to all organization commanders.

On Thanksgiving Day and on Christmas Day the cost of one ration of turkey is used in lieu of the cost of the fresh beef and bacon component of the garrison ration for those days.

When it is impracticable for the quartermaster to bake soft bread, or if for any reason it is more economical to purchase soft bread than to bake it, the bread becomes a component article of the ration in lieu of flour, and its price is used in computing the value of the ration.

Purchases. All component articles of the ration and sales articles on the authorized list required for the supply of troops must be purchased from the quartermaster when available, except under the following conditions:

1. Detached troops authorized to submit ration returns in advance.

2. Special grades of stores of the authorized rations required for the proper diet of the sick and of Army nurses and other women employees subsisted on the status of Army nurses, when approved by the commanding officer of the station or general hospital.

Issues on the March. When on a march in time of peace, a daily issue of rations may be ordered by the commanding officer. Such issues do not exceed the allowances prescribed for the garrison ration and are made in the manner prescribed in regulations for use in time of war.

When issues of rations in kind are ordered as above authorized the ration savings privilege is suspended, except that when so ordered, in writing by the commanding officer, the savings privilege may be allowed on certain specified articles of the ration.

Closing the Account. At the end of the month the ration and savings account is closed, and the amount due the organizations paid by the finance officer.

Hospital Diets. Different classes of diet are necessary in hospital because of the great variety in the nature and severity of the diseases treated therein. The arrangement of the diet tables is based upon our knowledge of the relative digestibility of the different sorts of food, and the part which the different portions of the digestive tract take in the process of digestion.

The diets usually employed in military hospitals are *full, light, liquid,* and *special.*

Full diet includes what is served at the table in the dining-room; the other diets are ordinarily served in the wards.

Light diet includes liquids and the simpler and more digestible articles of solid or semisolid foods.

Liquid diet: This includes *liquids only,* such as milk, strained soups, gruels, broths, albumen water, etc. The amount of each of these articles to be taken by a patient in twenty-four hours should always be stated.

Special diet: This is usually a list from which special articles of food are prescribed by ward officers for particular cases requiring variations from the standard diets being supplied.

As to which diet shall be given to a particular patient depends upon the nature of the case. In all fevers and grave disorders, while there is increased necessity for food to repair the unusual waste, there is unfortunately also diminished power of digestion and assimilation.

Therefore we begin with liquid foods to save the digestive apparatus the labor of liquefying them, and we give them in small quantities and frequently.

If there is irritation of the stomach and bowels we give those foods which have the least indigestible residue to irritate the bowels. From liquids we go on to jellies, custards, ice cream, light puddings, milk toast, lightly boiled eggs, chicken, rare steak, etc.

Each hospital commander usually patterns his diet list after his own views; the tables below, used at one of our large general hospitals (month of July), may be taken as an illustration of full and light diets.

Full Diet

BREAKFAST	DINNER	SUPPER
	Sunday.	
Cantaloupe Shredded Wheat and Milk. Eggs. Rolls and Butter. Coffee.	Chicken Fricassee. Mashed Potatoes. Corn Pudding. Bread and Butter. Ice Cream. Coffee.	Cold Meats. Macaroni and Cheese. Pickles. Bread and Butter. Plums, fresh. Iced Tea.
	Monday.	
Oranges. Cornmeal fritters Bacon. Biscuits and Butter. Coffee.	Beef Steak and Gravy. Boiled Potatoes. Breaded Tomatoes. Bread and Butter. Apple Pie. Cheese. Coffee.	Baked Beans. Cottage Cheese Salad. Bread and Butter. Cinnamon Rolls. Iced Tea.
	Tuesday.	
Stewed Prunes. Oatmeal and Milk. Cr. Chipped Beef. Bread and Butter. Coffee.	Baked Ham. Fried Potato. Creamed Cabbage. Bread and Butter. Peach Tapioca Pudding. Coffee.	Cold Meats. Hashed Brown Potatoes. Vegetable Salad. Fresh Fruits. Iced Tea.
	Wednesday.	
Bananas. Cornflakes and Milk. Eggs. Bread and Butter. Hot Cakes and Syrup. Coffee.	Roast Veal and Dressing. Mashed Potatoes. Beets, buttered. Bread and Butter. Ice Cream. Coffee.	Irish Stew. Baked Potato. Tomato Salad. Bread and Butter. Cherries, fresh. Iced Tea.
	Thursday.	
Oranges. Shredded Wheat and Milk. Eggs. Bread and Butter. Coffee.	Roast Pork. Parsley Potatoes. Squash. Bread and Butter. Chocolate Pudding. Coffee.	Baked Hash. Creamed Potatoes. Cole Slaw. Bread and Butter. Stewed Rhubarb. Iced Tea.
	Friday.	
Stewed Peaches. Cornmeal and Milk. Bacon Bread and Butter. Coffee.	Baked Fish. Mashed Potatoes. Breaded Tomatoes. Pickles. Bread and Butter. Cocoanut Cream Pudding. Coffee.	Bologna. Macaroni and Cheese. Sliced Cucumbers. Bread and Butter. Pineapple, fresh. Iced Tea.

Saturday.

BREAKFAST	DINNER	SUPPER
Applesauce. Grape Nuts and Milk. Sausage, fried. Cornbread and Butter. Coffee.	Roast Beef. Baked Potato. Turnips, buttered. Bread and Butter. Cottage Pudding. Coffee.	Liver and Bacon. Fried Potatoes. Pickled Beets. Bread and Butter. Doughnuts. Iced Tea.

Light Diet

Sunday.

Oranges. Cereal and Milk. Eggs. Toast and Butter. Coffee.	Soup. Chicken Fricassee. Mashed Potato. But. Spinach. Toast and Butter. Ice Cream. Milk.	Soup. Creamed Eggs. But. Spaghetti. Vegt. Salad. Toast and Butter. Fruit. Milk.

Monday.

Oranges. Cornmeal and Milk. Bacon. Toast and Butter. Coffee.	Soup. Creamed Sweetbreads. Mashed Potato. Breaded Tomatoes. Toast and Butter. Pudding. Milk.	Soup. Buttered Asparagus. Baked Potato. Cottage Cheese Salad. Toast and Butter. Fruit. Milk.

Tuesday.

Prunes, stewed. Oatmeal, and Milk. Creamed Chipped Beef. Bread and Butter. Coffee.	Creamed Chicken. Soup. Buttered Potato. Spinach. Bread and Butter. Pudding. Milk.	Soup. Creamed Eggs. Baked Potato. Salad. Toast and Butter. Prune Whip. Milk.

Wednesday.

Oranges. Cornflakes and Milk. Eggs. Toast and Butter. Coffee.	Soup. Baked Fish. Mashed Potato. Buttered Beets. Bread and Butter. Ice Cream. Milk.	Soup. Asparagus. Baked Potato. Tomato Salad. Toast and Butter. Cherries. Milk.

Thursday.

Oranges. Shredded Wheat and Milk. Eggs. Bread and Butter. Coffee.	Soup. Fricassee Chicken. Parsley Potatoes. Squash. Bread and Butter. Chocolate Pudding. Coffee.	Soup. Creamed Mushrooms. Creamed Potatoes. Lettuce Salad. Stewed Rhubarb. Coffee.

BREAKFAST	DINNER	SUPPER
	Friday.	
Peaches.	Soup.	Soup.
Corn meal and Milk.	Fish.	Creamed Eggs.
Bacon.	Mashed Potato.	Spaghetti.
Toast and Butter.	Breaded Tomatoes.	Celery.
Coffee.	Toast and Butter.	Toast and Butter.
	Pudding.	Pineapple.
	Milk.	Milk.
	Saturday.	
Applesauce.	Soup.	Soup.
Cereal and Milk.	Creamed Sweetbreads.	Asparagus.
Eggs.	Mashed Potato.	Baked Potato.
Toast and Butter.	Beets.	Tomatoes.
Coffee.	Toast and Butter.	Toast and Butter.
	Fruit Jello.	Peaches.
	Milk.	Milk.

The Principles of Cooking. Practical cooking can be learned only in the kitchen, where men who aspire to be cooks must serve an apprenticeship. Owing to the necessity for a rotation of duty assignments in many hospitals the principles of cooking and dieting are taught many of the personnel.

Cooking implies a knowledge of cereals, vegetables, fruits, spices, and the savor of meats. It means carefulness, inventiveness, willingness and readiness to use appliances and ingredients which assure economy, without impairing the wholesomeness of the food to be served. A knowledge of quantities and qualities of food-stuffs instills a higher appreciation of the real nutritional value of the soldier's ration and enables the cook to direct and effect a greater economy in the kitchen.

Variety is of much importance and may be obtained through the use of alternative issues, by purchases from the hospital fund, and especially by varying the methods of cooking the food. "Cook-books" should be freely and frequenty consulted.

Wastage must be carefully avoided. Grease and drippings should be reserved for use in cooking, and bones for the preparation of soup.

Nearly all food is capable of prompt putrefaction; putrefaction is due to the growth of germs, and requires the presence of heat, moisture, and organic matter; if any one of these conditions is absent putrefaction will not take place. Hence meats will keep indefinitely when frozen (absence of a suitable temperature); when dried (absence of moisture); canned (absence of germs, which have been destroyed by heat); or when pickled (absence of germs, which have been killed by antiseptics, such as salt, vinegar, and sugar).

A clean kitchen means the practical absence of germs; in such a kitchen foods do not spoil or putrefy.

The following extracts from an old work on "Camp Fires and Camp Cooking" are worth repeating here:

"Cleanliness is next to godliness, both in person and kettles: Be ever industrious, then, in scouring your pots. Much elbow grease, a few ashes, and a little water are capital aids to the careful cook. Dirt and grease betray the poor cook and destroy the poor soldier, whilst health, content, and good cheer should ever reward him who does his duty and keeps his kettles clean. In military life, punctuality is not only a duty, but a necessity, and the cook should always endeavor to be exact in time. Be sparing with sugar and salt, as a deficiency can be better remedied than an overplus.

"Remember that beans, badly boiled, kill more than bullets; fat is more fatal than powder. In cooking, more than anything else in the world, always make haste slowly. One hour too much is vastly better than five minutes too little, with rare exceptions. A big fire scorches your soup, burns your face, and crisps your temper. Skim, simmer, and scour are the true secrets of good cooking."

Cooking improves the flavor of food and thereby increases the appetite; it destroys all parasites and disease germs; and it enables the food to be more thoroughly masticated and digested.

It lessens the toughness of muscular fibres, gelatinizes the connective tissue, coagulates albumin, breaks up the starch granules and converts them into glucose, all of which permits of more thorough penetration of the digestive fluids and more rapid digestion.

The ordinary processes of cooking are *boiling, stewing, roasting, baking, frying,* and *broiling* or *grilling.*

Boiling. In *boiling,* the object is to cook the food and at the same time retain in it all its natural juices. To do this with fresh meat and vegetables the water should be salted, and the food in large masses dropped at once in boiling water; this by coagulating the albumin in the outer layers forms a protecting coating which prevents the juices from escaping.

Active boiling is continued for five minutes, after which the process should be one of *simmering* or very slowly boiling.

Salt meats, beans, and peas should be put on in cold water and the temperature slowly raised.

Potatoes should be boiled in their jackets, but if peeled the water should be salted to prevent the escape of the vegetable salts.

Fish and potatoes should be thoroughly drained after boiling. Beans, peas, rice, and other hard grains require a preliminary soaking; the two former can not be cooked in hard water. Fresh meats require about fifteen minutes to the pound.

Stewing. In *stewing* meats we do not mind the escape of the juices because the *broth,* as the water in which meat is boiled is called, forms a part of the food, all of which is to be eaten. Therefore the meat is cut in small pieces, placed in cold water, and the boiling done very slowly; vegetables are usually added. If the stew is made with meat which has already been cooked it is known as a *hash.*

In *soup making* the broth is the part used, hence we desire to get out of the meat and bones and into the water all that can be extracted of their nutritive ingredients, and especially the gelatin which is a result of a prolonged boiling of the bone and connective tissues. The meat is cut in small pieces and the bones thoroughly cracked, and all placed in cold water in a covered pot which should simmer slowly and be frequently skimmed. The product when finished constitutes *stock,* and the various soups are prepared by adding vegetables cut into small pieces, and cooking for an hour or so more or until the vegetables are done. Soup stock should not be kept in an iron pot because the iron gives it an unpleasant flavor.

In making *meat teas* or *extracts* by heat, the process is a little different from soup making; we do not wish any fat, hence lean meat is selected without bone, and all fat is removed after the broth is cold; the water should never come to a boil so as not to coagulate the albumin which we wish to retain.

Roasting and Baking. *Roasting* is properly done in front of a clear fire with special arrangements for concentrating the heat and turning the joint. In this country the term *roast* is ordinarily applied to *baked meats.*

Baking is done in an oven, and as the fat acids developed by high temperature can not escape, the flavor and digestibility are not so good as in roasting. As in boiling, our object is to expose the roast to a high temperature in order to coagulate the surface layer so that it may retain the juices; when that is accomplished the balance of the cooking is done more slowly at a lower temperature. Frequent *basting* with the melted fat and meat juices is necessary in order to prevent the surface becoming too tough and hard, and to secure better penetration of the heat to the interior of the joint. The oven must not be too hot; if the hand and arm can be held in the oven for fifteen seconds the temperature is about right. Baking ordinarily requires about fifteen minutes to the pound.

Broiling and Frying. *Broiling* or *Grilling* is practically the same as roasting, only the cooking is done over instead of in front of the fire, and a larger extent of surface is exposed to the heat.

The meat is placed on a gridiron or broiler over a clear bright fire free from smoke. If the broiling is done before a fire instead of over it, the juices can be caught in a drip pan and used.

Frying is properly done by dropping the meat or vegetables in boiling oil or fat at a temperature of about 500° F. and in a frying pan deep enough to immerse the article to be cooked. If the fat is hot enough the surface layer of the meat is at once coagulated, as in boiling and roasting, and the grease does not penetrate.

Frying is usually improperly done, the bottom of the frying pan being only greased enough to prevent the meat from sticking to it; articles thus fried are saturated with grease and indigestible.

Bread Making. The object of *bread making* is to convert an indigestible, tasteless mass of flour into an appetizing, porous food capable of ready penetration by the digestive juices, and known as *bread.*

The first step is to make the dough, which is done by thoroughly mixing or *kneading* the flour with salt and water; the next step is to impart the necessary porosity by the introduction of carbonic-acid gas into the mass; this is done by either generating it within the dough or forcing it in from without.

The first of the methods may be effected either by fermentation of *yeast* or by *baking powders;* the second constitutes the so-called *aerated bread,* a process little used in this country.

The carbonic-acid gas is held in minute bubbles by the tenacity of the *gluten,* the nitrogenous element of flour, and the dough *rises,* becoming light and spongy. It is then kneaded over again, divided into loaves of suitable size, allowed to rise for about one hour in the forms, and then baked, by which the gas is still further expanded, the dough made lighter, and the porosity permanently fixed in the *bread.*

By *leavened bread* we mean that which has been made by fermentation; yeast may be used directly, or we may use a portion of old fermenting dough or leaven; the former is preferable.

In the growth of the yeast fungus a portion of the sugar of the dough is converted into alcohol and carbonic acid; the former is driven off by the heat in baking, and the latter is spread through the dough, making it porous. Usually a portion of the flour is first made into dough with yeast, salt,. and water, and set aside in a warm place for a couple of hours, this constituting the *sponge* which is subsequently thoroughly kneaded with the remainder of the flour and water, and the fermentation allowed to proceed in the entire mass.

The important point is to know just when it has gone far enough; if it goes too far the bread becomes *sour,* if not far enough it is *heavy.*

The necessary carbonic acid may also be generated by the use of *baking powder;* this consists generally of bicarbonate of soda mixed with cream of tartar, acid phosphate of lime, or alum; in the chemical reaction which takes place in the dough carbonic-acid gas is set free and certain more or less harmless salts remain in the bread. Alum baking powders are objectionable because the remaining salts are believed to cause indigestion.

The Preparation of Vegetables. The following suggestions regarding the cooking of vegetables will be found helpful:

Cook green vegetables rapidly, generally under cover in boiling salt water, the time allowed depending on the vegetable cooked, but as a rule not in excess of 20 minutes, in order to avoid destroying their vitamine content.

All vegetables should be carefully drained after being cooked.

It is a good rule to use only enough water to cover the vegetables being cooked. As the water evaporates, add more *boiling* water. Sulphurous vegetables (like cabbage), however, should be well immersed in water, otherwise they will be tough and discolored, and their flavor changed.

Vegetables are best when freshly gathered. If slightly wilted, soak them in cold water. Even when wilted such soaking improves them, as it renders them more crisp and palatable. Onions, cabbage, and cauliflower, if soaked in cold water for one hour before cooking, are less objectionable in odor.

Onions, cabbage, and cauliflower should be boiled in an uncovered pot and the water changed at least once while cooking. Soda should not be added to the water for to do so would destroy the vitamines.

Beans and peas should be strung or shelled and washed quickly. If cold water is allowed to stand on them very long, it removes much of their nutritious quality.

Care must be taken not to break the skins of beets, as much of the coloring matter will escape in cooking.

Carrots should be scraped and turnips pared before cooking. Both should be sliced thin.

After husking green corn all the silk should be removed from the ears. Corn should not be washed. It should be eaten the day it is pulled.

Young potatoes should be scraped and old ones peeled. If boiled potatoes, after draining, are allowed to remain in the boiler uncovered on the range a few minutes their flavor will be much improved.

Spinach should be thoroughly washed in several waters to insure the removal of grit. After cooking, drain in a collander and dress with melted butter, pepper, and salt.

Insects are likely to gather in the hearts of cabbages. If the heads are to be cooked whole, first place them in the water, top of heads down, to remove the insects.

Small parsnips may be cooked whole; if large, they should be cut lengthwise. To keep the flesh from darkening, remove all specks and trim off the fine roots.

Lima beans should be removed from the range when they come to a boil and set in a large pan, containing about one inch of boiling water.

Approximate Measures. Four teaspoonfuls of liquid are equal to one tablespoonful.

Three teaspoonfuls of solid material, as sugar or arrowroot, are equal to one tablespoonful.

One tablespoon contains one-half a fluid ounce.

One coffee cup, usual size, contains eight fluid ounces.

One glass tumbler, usual size, contains eight fluid ounces.

Two coffee cups or glass tumblers, usual size, are equal to one pint.

Recipes for Liquid Diet. (*Munson*):

Sterilized Milk. Pour the milk into a granite saucepan (or a double boiler) and raise the temperature of milk to about 190° Fahrenheit. Keep it at this point for one hour. Do not boil the milk. Any utensil used for this purpose must be absolutely clean.

Milk Punch. Three-fourths of a coffee cup of milk (six ounces).
Two tablespoonfuls of brandy or whisky.
One teaspoonful of sugar.
Grated nutmeg to taste.

Sweeten the milk (preferably sterilized) with the sugar. Stir into it the brandy. Shake it up well by pouring from one cup into another, or by the use of a milk-shaker, until a froth is formed. Grate a little nutmeg on top and serve.

The term "cup" in this recipe, as in all others, means the ordinary coffee cup, holding eight ounces.

Milk with Mineral or Aerated Waters. Mix equal quantities of sterilized milk with seltzer, soda water, or lime water, and serve immediately.

Albuminized Milk. Beat up the white of an egg till light. Add a good-size pinch of salt, and four ounces of fresh, cool milk which has been sterilized. A little sugar may be added if desired.

Peptonized Milk (Cold Process). Into a clean quart bottle put two peptonizing tablets dissolved in four ounces of cold water. Add one pint of fresh cold milk, shake thoroughly, and place the bottle on ice. Use clean cotton to plug the bottle.

In place of the peptonizing tablets, five grains of pancreatine and fifteen grains of sodium bicarbonate, to be obtained from the pharmacy, may be employed.

Peptonized Milk (Warm Process). Into a clean quart jar or bottle put the tablets above mentioned, dissolved in four ounces of cold water. Add one pint of fresh milk and shake the whole well. Place the bottle in a pan or kettle of hot water maintained at such a temperature that the hand can just be held in it without discomfort. Keep the bottle in the water for ten minutes. Put on ice immediately after removing from the hot bath, to check further digestion. If ice is not available pour the milk into a saucepan and heat quickly to boiling.

Whey. Warm one pint of milk to about blood heat, or about 100° Fahrenheit. Dissolve half a rennet tablet in one tablespoonful of cold water. Stir it into the milk and let it stand until the latter is curdled, which will be in a few minutes. Break up the curd with a fork and strain off the liquid (whey). This may be sweetened with sugar, and when cooled makes a refreshing drink for fever patients.

Junket. Heat one pint of fresh unboiled milk to about blood heat, or about 100° Fahrenheit. Dissolve a full tablespoonful of sugar in it. Add half a rennet tablet which has been dissolved in one tablespoonful of cold water. It will set the milk in about fifteen minutes. Put in a cool place till ready to be used. It can be served plain, or with cream, sugar, and a little nutmeg.

Farina Gruel. One tablespoonful of farina.
One pint of water.
One teaspoonful of sugar.
One-half teaspoonful of salt.

Into one pint of water, raised to boiling, put a half teaspoonful of salt; then add the farina and cook for twenty minutes. Flavor with sugar and condensed milk, if fresh milk is not available. Strain and serve hot.

In this recipe, as in others, condensed milk is used in a strength of one teaspoonful to the half pint of gruel.

Rice Gruel Two tablespoonfuls of rice.
Or one tablespoonful of rice flour.
One pint of boiling water.
One-half teaspoonful of salt.
One teaspoonful of sugar.

Wash the rice thoroughly in two waters, after removing any specks that may be mixed in the grain. Have the cooking water boiling. Add the salt and then the rice. Boil for two hours, when the rice should be almost entirely dissolved. Strain. Add condensed milk and sugar, if desired. Some persons prefer the use of salt alone.

If ground rice or rice flour is used, it should be mixed with cold water before mixing with boiling water, and requires but thirty minutes' boiling. Flavor with sugar or condensed milk.

Hard-Bread Gruel. Toast hard bread thoroughly and grind it into a powder. To one pint of boiling water, to which one-half teaspoonful of salt has been added, add two tablespoonfuls of hard-bread powder. Boil ten minutes and then strain. Flavor with one teaspoonful of sugar and one teaspoonful of condensed milk to each cupful of the gruel.

Koumyss. Dissolve one-fourth cake of compressed yeast (Fleischmann's) in a little warm water. If Fleischmann's yeast is not obtainable, use one-fourth cake of ordinary compressed yeast or half a fluid ounce of baker's yeast. Warm one quart of fresh milk to about 90° Fahrenheit, add one tablespoonful of sugar and the dissolved yeast; thoroughly mix and put into a stout bottle, tying a small piece of cloth firmly over the cork to hold it in place. Shake well, and allow to stand for six hours at a temperature of about 70° Fahrenheit. Then put the bottle on ice upside down, and allow to stand for three days before using. Condensed milk may be used with as good a result as fresh milk. Use five parts of water to one part of condensed milk, and omit the sugar.

Lemonade. One small lemon or lime.
One tablespoonful of sugar.

Three-fourths of a coffee cup of water (six ounces).

Wash and wipe the lemon or lime. Squeeze the juice into a glass or bowl.

Then add the sugar, pour on the water, and strain. Serve at once. Boiled or sterilized water should be used.

Orangeade. One orange.

One teaspoonful of sugar.

Three-fourths of a coffee cup of water (six ounces).

Wash and wipe the orange. Squeeze the juice into the sugar. Add the cold water, previously boiled. Strain and serve.

Eggnog. One egg.

Two teaspoonfuls of sugar.

Three-fourths of a coffee cup of milk (six ounces).

Salt to taste.

Beat the egg up till light. Add sugar and salt and then the milk, which is better when not too cold. With the addition of one or two tablespoonfuls of brandy this makes a very strengthening drink for convalescents.

Egg Lemonade. One egg.

One small lemon.

Two teaspoonfuls of sugar.

Beat up the white and yolk of the egg separately; add sugar to yolk. When both are light, mix them together and add the strained juice of the lemon. Pour into a glass and serve with a spoon.

A little cold water may be added if the beaten egg is too foamy.

Sherry and Egg. One egg.

One teaspoonful of sugar.

Two tablespoonfuls of sherry wine.

Break the egg into a bowl and add the sugar. Beat the two together until they are thoroughly mixed. Add two tablespoonfuls of sherry wine and an equal quantity of cold water. Mix thoroughly, strain, and serve immediately.

Coffee. To each cup of water allow one tablespoonful of coffee, freshly roasted and ground. Have the water boiling. Mix the coffee with a little cold water and pour it into the boiling water. Let the whole come to a boil, and then set aside for five or ten minutes to steep and settle before using. If muddy it may be cleared by boiling with egg shells, or, in their absence, by a dash of cold water. Add sugar and fresh or condensed milk to flavor as desired.

Tea. To each half-pint of boiling water add one teaspoonful of tea. Let it steep or infuse for five minutes. Never let tea boil. Add sugar and fresh or condensed milk to flavor as desired.

Beef Juice. Cut a lean piece of steak, from the round or other good portion, about one-half pound in weight. Remove all fat and fibrous tissue. Broil over a clear, hot fire so that the meat becomes pink and full of juice. It should not be merely done on the outside and raw inside. Cut into small pieces and squeeze out the juice. Add a little salt and it is ready to serve.

If it is needed warm, place the cup holding the juice in a bowl of warm water. Do not let the temperature of this water exceed 160° Fahrenheit.

Beef Tea with Hydrochloric Acid. Select and prepare the beef as above. Put into a bowl and pour over it one cupful of cold water, to which five drops of dilute hydrochloric acid have been added. Let the whole stand for two hours in a cool place. Strain, add salt to flavor, and serve cold. This tea may be heated; but the albumin which coagulates and appears as brown flakes should not be strained out, for it is the nutritious portion of the tea.

Beef (or Mutton) Broth. One pound of lean beef (or mutton).
One quart of water.
One teaspoonful of salt.

Soak the meat, previously chopped fine, in the cold salted water for at least two hours, in the vessel in which it is to be cooked, keeping it on ice or in a cool place during this time. Then expose to moderate heat. Keep the vessel covered and allow the broth to simmer, keeping up the original quantity of water, for three hours at least. Let it cool overnight, skim off the fat in the morning, and keep covered in a cool place until needed. Heat and serve as required.

Chicken Broth. Fowls are better to use for broth than young chickens. Pluck and prepare by singeing with a blazing newspaper, straw, or dry grass. Remove all refuse—entrails, oil bag, crop, lungs, etc. Wash well in cold water, then cut up and disjoint. To each pound of chicken add a quart of cold salted water and simmer for two hours; then boil for two hours. Add rice or powdered hard bread or soft bread crumbs in the proportion of one tablespoonful to each quart of water. Vegetables, such as onions, garlic, carrots, celery, and parsley, may be also used, a tablespoonful to the quart, and should be put in when the broth is first put on to cook. Strain, remove the fat, and serve hot.

Canned Soups. To render canned soups ready for eating simply raise them to the boiling point by immersing the cans in boiling water for half an hour to thoroughly heat the contents; or empty and heat the contents in a granite saucepan. After diluting with the proper amount of water, following directions on the cans, they are ready to serve. Before heating any canned article a hole should be punctured in the upper end of the can.

Clam Broth (Canned). This may be served hot or cold. If the broth is desired plain, add an equal quantity of water to the clam juice and heat to the temperature required. Do not boil. Clam broth can also be given iced. If fresh milk is available, equal parts of milk and clam juice may be heated up together.

Recipes for Light Diet. (*Munson*):

Poached Eggs. Pour sufficient boiling water into a clean cooking utensil and add salt in the proportion of one teaspoonful to the quart of water. Place it on the stove to boil. Break a fresh egg into a small dish, and when the water boils slide the egg gently into it. When the albumen or white is firm, or at the end of two minutes, lift the egg out of the water with a skimmer and place it on a piece of hot, nicely-browned toast or hard-tack. Sprinkle with a little salt and pepper and serve hot.

Soft Cooked Eggs. Put into a saucepan as many eggs as are to be cooked. Pour over them water enough to cover. The water should have been brought up not quite to the boiling point. Let the eggs stay in the water from seven to ten minutes, and the result is an evenly cooked egg throughout. When the water is poured on the eggs do not set the pan on the fire. No further heating is required, but the water should not be allowed to cool down too rapidly.

Omelet. Two eggs.
Two tablespoonfuls of milk, cream, or water.
One-fourth teaspoonful of salt.
Pepper to taste.

Beat up the yolks and whites of the eggs separately. Add the salt to the yolks. Mix the whites and yolks together with the milk, cream, or water. Place a small piece of butter or bacon fat in a pan or plate hot enough to melt it. Pour in the omelet, and with a sharp knife, loosen the edges as they solidify and fold over the omelet into a half-circle. When done, turn out on a plate and serve hot. When milk can not be had, water may be used.

Spanish omelet has minced onion added to the above. An excellent addition to the plain omelet is a dressing made of canned tomatoes and boiled, crumbled, hard bread, strained, seasoned, and heated together. Never use flour in an omelet, as it can not be cooked sufficiently in the short time that should be given to eggs.

Baked Custard. One pint of fresh milk.
Two eggs.
One-third teaspoonful of salt.
Two tablespoonfuls of sugar.
Small piece of cinnamon.

Put the cinnamon in the milk and pour into a saucepan to heat. Break the eggs into a bowl with the sugar and salt, and beat until well mixed but not light. When the milk comes to a boil pour it over the eggs. Stir slowly to dissolve the sugar. Strain the mixture into cups, set them in a deep pan of boiling water, and bake for twenty minutes in a moderately hot oven.

Dry Toast. Cut the bread in slices one-third of an inch in thickness. Toast may be made either by drying bread in an oven and then placing on a toaster over the fire, or the bread may be allowed to dry and brown in the oven. Toast that is moist and soft in the middle should never be given to an invalid. Have it dry, crisp throughout, and of a golden-brown color. Serve hot, either dry or buttered.

Milk Toast. Put a cup of milk into a saucepan and let it heat to the boiling point. Have ready three slices of nicely browned bread. Put a little salt in the milk and pour it over the toast. A little butter may be spread on the latter, but it is a more delicate dish without it. Serve hot.

Oatmeal Porridge. Three tablespoonfuls of oatmeal or rolled oats.
One pint of boiling water.
One-fourth teaspoonful of salt.

Dissolve the salt in the water, then add the oatmeal. Cook for two hours in a double boiler. Rolled oats require cooking only half an hour. Oatmeal is very appetizing when served cold in mold shapes, and it will frequently be eaten in this way when it would be refused if served in any other form. Variations may be made by using farina, browned rice (browned in the oven before steaming and molding), arrowroot, etc., giving further change by serving occasionally with sweetened fruit juices, fresh, dried, or canned, instead of cream or milk.

Farina Mush or Porridge. Three tablespoonfuls of farina.
One pint of boiling water.
One-half teaspoonful of salt.

The water must be boiling before putting in the farina. Boil for half an hour. It may be served with fresh milk, or condensed milk diluted one to four parts of boiling water, or with stewed dried fruit, such as prunes, peaches, or apples. Cold farina mush may be sliced and fried for the use of convalescents.

Plain Boiled Rice. One-half cup of rice.
Two cups of boiling water.
One-half teaspooonful of salt.

Pick the rice clean. Wash thoroughly in two waters, pouring off the last when ready to put the rice into the boiling water. Add the salt to the water. Pour in the rice and boil steadily for half an hour. In order to see if the rice is done, take out some of the grains and crush between the fingers. If done, they will mash easily and feel perfectly soft. Do not stir the rice, as this will cause it to fall to the bottom and burn. Serve with sugar and fresh or condensed milk, or with stewed fruits.

Steamed Rice. Wash the rice thoroughly in two waters. Use in same proportions as are given for boiled rice. Use a double boiler. Have the water boiling in lower boiler. Place the above mixture of rice, boiling water, and salt in the upper chamber, and let cook for one hour. Do not stir. Keep the rice covered while steaming, and keep the lower boiler well supplied with boiling water. Serve as with boiled rice.

Milk Porridge. The flour for milk porridge should be prepared in the following manner: Tie up in a muslin bag or towel as much flour as desired and boil for four or five hours, then bake in an oven until dry. To make the porridge, grate two tablespoonfuls of the dried flour, mix it with cold water into a paste, and add to it one pint of boiling milk or boiling water. Boil for ten minutes. If water alone is used to make the porridge, condensed or fresh milk may be used in addition, in equal parts, or diluted one-half with water.

Condensed milk used in this recipe is made in the strength of one part of condensed milk to four of water. Salt is added in proportion of one teaspoonful to the quart of boiling milk or water.

Lemon Jelly. One-fourth box of gelatin (one-half ounce).
One-fourth cup of cold water.
One-fourth cup of fresh lemon juice (about the amount yielded by two lemons).
Three tablespoonfuls of sugar.
One and one-fourth cups of boiling water.

Put the gelatin to soak in the cold water, about twenty minutes being required for this process. When dissolved, pour on the boiling water. Add the lemon juice and sugar. Stir thoroughly and strain through a fine-meshed cloth into a china or granite-ware mold, cooling in a refrigerator or by placing in a pan of cold water. Never use tin molds for lemon jelly.

Coffee Jelly. One-fourth box of gelatin (one-half ounce).
One-fourth cup of cold water.
One cup of boiling water.
One-half cup of strong coffee.
Two tablespoonfuls of sugar.

Soak the gelatin in the cold water for half an hour. Pour on the boiling water, then put in the sugar and coffee. Strain it through a cloth into a mold or dish in which it may be cooled, either in a pan of iced water or in a refrigerator. Coffee jelly may be served with cream and sugar.

Have the coffee strong, two tablespoonfuls of coffee to each cup of water. Where vanilla extract is available, one-half teaspoonful will be advantageously added to the above recipe.

Wine Jelly. One-fourth box of gelatin (one-half ounce).
One-fourth cup of cold water.
One-half cup of sugar.
One-half cup of sherry wine.
One and one-fourth cups of boiling water.
One small piece of cinnamon.

Put the gelatin and cold water together in a dish large enough to hold the whole mixture. Let it soak for half an hour, then pour the boiling water (in which the piece of cinnamon has been simmering) over the softened gelatin. Add the sugar and wine. strain through a clean cloth into a china or granite-ware mold, and cool in a refrigerator or a pan of cold water.

Stewed Dried Apples, Apricots, or Peaches. Wash the fruit thoroughly. Soak for four or five hours in the cold water it is to be cooked in, using only a sufficient quantity of water to cover. Heat in a covered granite-ware saucepan, simmering slowly for two hours. Do not boil. If the fruit is allowed to simmer it will not burn or need stirring, which breaks it up and makes it look unsightly. Apricots need plenty of sugar, but this should not be added until five minutes before taking off the fire. Lemon juice or lemon peel may be added to poorly flavored apples, a tablespoonful of the juice or the peel of half a lemon to the pound of fruit, or spices may be used for flavoring. The use of brown sugar in stewing dried fruit is to be preferred, because of the better flavor which it gives.

Baked Apples. Select fair, sound, and perfectly tart apples. Wash and wipe them and cut out the cores, removing all the seeds and husks. Cut off any dark spots on the outside. Put the prepared apples into a granite or earthenware dish. Put into each apple from one-half to one teaspoonful of sugar, according to the acidity of the fruit, and a bit of lemon peel. Pour boiling water into the dish about one-fourth inch deep, and bake in a moderately hot oven. When perfectly soft all through, the fruit is done. The time for baking varies, according to the species of apple, from half an hour to two hours.

Canned Fruit, Serving of. Remove from cans several hours before using and put in porcelain or granite-ware dish to cool. Canned fruit is much improved by cooling, being more palatable and refreshing than if served direct from the can. Never allow fruit to remain in cans when once opened. This applies particularly to very acid fruit, and also to meats, fish, or vegetables.

Baked Potatoes. Have the potatoes of a uniform size, so that all may be done at the same time. Wash them thoroughly and bake in a hot oven from forty-five to fifty minutes. They are recognized as being done by the soft, yielding sensation given on pinching.

Roasted Potatoes. Bury under the hot ashes of an open fire (camp) for half an hour or more. The thoroughness of cooking is recognized as with baked potatoes. Break open by squeezing. Brush the ashes off first.

Boiled Potatoes. Wash the potatoes well. Pare carefully so as not to waste. Put them on to cook in boiling salted water, enough to cover, and let boil for thirty minutes. It requires more time for large-size potatoes. When easily pierced with a fork they are done. Drain off the water, and dry them on top of the stove by moving the boiler back and forth for a minute or two. Serve as quickly as possible after they are cooked.

Mashed Potatoes. Prepare as for boiled potatoes. When cooked, drain off the water and mash in the dish in which they were boiled. Add butter, pepper, and salt to taste, and lastly put in a little milk or cream. Whip up lightly and serve immediately. Keep the dish covered until served.

Scraped Beef. Cut a piece of steak from the round, about half a pound in weight and about an inch thick. Lay it on a clean meat-board and with a dull knife scrape out the pulp until there is nothing left but stringy fiber. Season the scraped pulp with salt and make it into small cakes. Broil for two minutes either by direct heat over a clear fire, or by heating a clean pan or plate and, when hot, placing the meat on it. Have both sides cooked sufficiently. This is safe food for a patient beginning to take solid nourishment. Scraped beef may be prepared very easily over an alcohol lamp.

Scraped Beef Sandwiches. Place a piece of round steak on a meat-board and scrape out all of the pulp with a dull knife; add to the pulp a little salt and pepper and enough raw beef juice to make it into a firm jelly. Have stale bread cut into very thin slices and spread the beef pulp on them; cut the sandwiches quite small. Never use butter in making beef sandwiches.

Broiled Beefsteak. Have a clear, hot fire, either coal or charcoal. Put the steak on a broiler, place directly over the fire for about a minute, then turn and do the same with other side. By applying greater heat at the outset the juices are kept in the meat. It requires from five to seven minutes over a clear fire to broil a steak an inch thick. Season both sides with salt and a little pepper, but no butter. Serve hot. A baked potato is a very good vegetable to serve with the above, as is also boiled rice.

Another good way to broil steak is to heat a granite-ware plate on a stove till it is quite hot. Place the steak on it till one side is done, then turn it and do the same with other side.

Stewed Chicken. Boil a chicken, prepared as for broth, until tender. Set it away till it is cool. Skim off the fat; take the meat and cut it up in cubes or small pieces, rejecting all skin, gristle, tendons, and bones. To one cupful of the meat add one pint of the broth, seasoning with salt and pepper. Mix one teaspoonful of flour with a little cold water, blend it thoroughly, and add it to the chicken. Let the whole stew for ten minutes, and serve with toast or boiled rice.

Minced Chicken on Toast. Prepare the chicken as for broth. When cool, skim off the fat and mince up the meat fine, rejecting all skin, tendons, gristle, and bone. Season with salt and a little pepper. Add enough broth, or better yet, cream, if available, to make it of the proper consistency, or about that of cream. Have ready some nicely-browned dry toast, pour the minced chicken over it, and serve hot.

Cooking in the Field. The means furnished for cooking in the field are field ranges, rolling kitchens (or trailers), and in emergencies the individual mess kit carried by each soldier.

Field ranges come in two sizes, known as No. 1 and No. 2. Field range No. 1 is authorized at the rate of one per 150 men when rolling kitchens are not provided. Field range No. 2 is smaller and intended for detachments or similar organizations of 50 men or less. Field ranges are portable steel fireboxes and easily handled. When being transported the utensils belonging to it are packed inside. The ranges are transported on an escort wagon or truck, accompanying the unit.

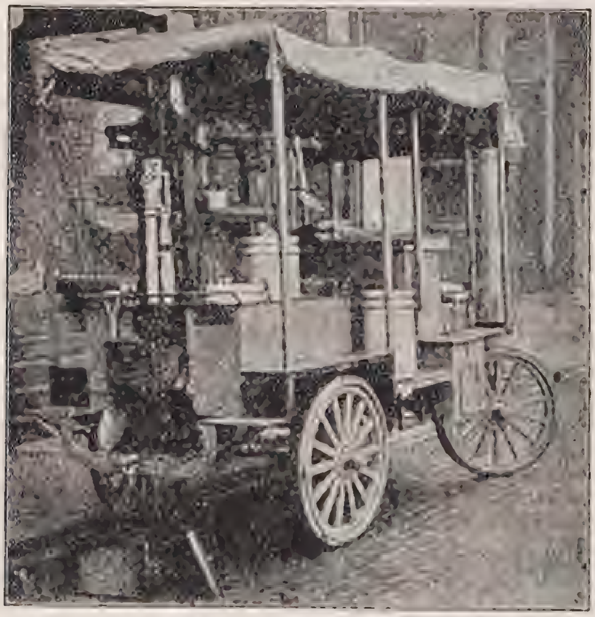


Fig. 169.—Rolling Kitchen. Latest pattern. Utensils unpacked and exposed to view.

The rolling kitchen (Fig. 169) or trailer, the former being hauled by four animals and the latter being trailed behind a truck, is designed to cook for 250 men. It carries rations for that number, fuel, and cooking utensils. If necessary the food may be cooked while enroute, thus assuring a hot meal for the troops it accompanies immediately upon arrival in camp. These rolling kitchens are by far the ideal method of providing meals for troops in the field.

As the reserve ration requires no cooking the individual mess kit is now seldom used for that purpose. In emergencies however, if bacon and other components of the field ration are available, the mess kit over a small fire serves satisfactorily in preparing a hot meal. The large half of the meat can, with its handle, makes a good frying pan, and the tin cup by means of its handle may be held or placed directly over the fire to boil water for coffee.

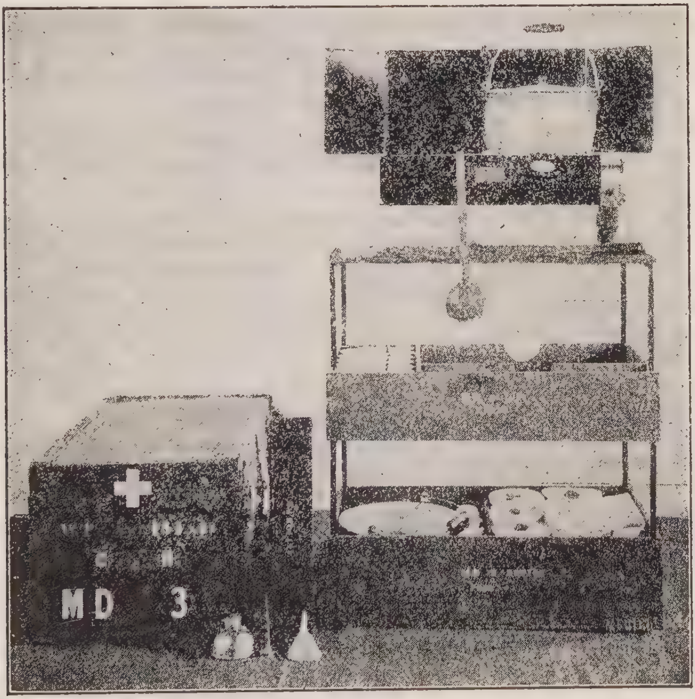


Fig. 170.—Chest M.D. No. 3. Contents unpacked and exposed to view. Furnished as part of all field medical outfits for purpose of providing hot liquid food for patients at the front.

All of our field medical outfits contain a chest known as MD 3 (Fig. 170) in which is carried material for preparing hot liquid nourishment for patients at the front. Even a small quantity of hot food is a pronounced stimulant to a man coming off the line and when wounded goes far towards warding off shock. This food chest, among other items, contains cocoa, coffee, tea, and evaporated milk, and utensils in which to prepare them. It also has a small gasoline-burning stove of a commercial camp-kitchen pattern. (See upper part of tray, Fig. 170.)

Useful Culinary Definitions. (*From Manual for Army Cooks*):

Acetic Fermentation. The normal fermentation of dough is alcoholic. The secondary fermentation (acetic or lactic) sets in when temperatures are too high or the normal fermentation is allowed to continue too long. The undesirable acetic fermentation can be controlled or prevented by adding salt or hop tea.

Adulteration. Any manipulation of a foodstuff which lessens its nutritive value and deceives the purchaser, or renders it harmful or undesirable as food. The most prevalent adulteration is the substitution of low quality goods for those of higher quality.

Aerated Bread. Bread raised by gas introduced mechanically into the dough and not by means of yeast fermentation, baking powder, or baking soda.

Ageing of Flour. New flour changes in character during storage. In dry, well ventilated storage (about 70° F.) the color of flour whitens and its bread making qualities improve. After six months storage flour does not improve appreciably in bread making qualities. It is best to mix with new flour an equal quantity of an old flour of known good quality. Good bread can be made from new flour by giving the dough a rapid fermentation at a low temperature. A stiff dough and plenty of yeast and salt should be used.

Albumen. The transparent nitrogenous substance which forms the chief and characteristic constituent of the white of an egg. Albumen is also found in blood, in all serous fluids, in many animals and vegetable juices and tissues.

Alcohol. A product resulting from the alcoholic fermentation by yeast of a solution of sugar and water. Sugar (sucrose) is first changed into glucose and similar substances and then in turn broken up into alcohol and carbon dioxide gas. The sugar solution may be ordinary sugar and water, or it may be the natural juices of fruit such as apples, grapes, etc., since all fruits contain a certain amount of sugar. The yeast may be wild spores introduced from the air or it may be added in the form of specially prepared compressed yeast, or yeast cakes, or homemade yeasts.

Allspice. The dried unripe fruit of a tropical tree cultivated principally in the West Indies. It is popularly supposed to combine the flavors of cinnamon, nutmeg and cloves; hence the name. It is one of the common spices and is used either whole or ground. Also called Pimento and Jamaica Pepper.

Anchovy. A small fish of fine and peculiar flavor—a member of the herring tribe.

Aniseed. Minute seeds of an annual plant cultivated in Europe and used chiefly for flavoring purposes. It can be used to impart a distinctive flavor to many bakery products.

Arrowroot. A starch derived from the roots of a West Indian plant. It has an insipid flavor but can be used as a thickening agent for gruel, etc.

Baking. Cooking in a dry heat.

Baking Powder. Is a leavening agent produced by mixing of an acid-reacting material (tartaric acid, phosphoric acid or compounds of aluminum or combinations of phosphoric acid and compounds of aluminum) and sodium bicarbonate, with or without a small amount of starch or other substances to keep the active agents separated. The soda and acid material react in the presence of water, liberating carbon dioxide gas, which forms pockets or cells in the dough, making it light and spongy. Cold water or cold milk should be used and the dough disturbed as little as possible after mixing. Bake immediately or keep in a cool place until it can be baked.

Baking Temperature. Generally stated as 385° F., though bread may safely be baked at a temperature between about 300° and 450° F. Many other articles are baked at much lower temperatures.

Barbecue. To roast or broil whole.

Baste. Sometimes to sprinkle, as with pepper and salt; generally to dash or pour a liquid over with a spoon, as in the case of gravy or stock in baking and roasting.

Batter. A semi-liquid mixture of ingredients, as flour, eggs, milk, etc., beaten together for use in cooking or baking.

Bay Leaves. Dried leaves of a small evergreen tree grown along the Mediterranean Sea. Much used in soups, stews and in pickling.

Beef Extract. Commercially, a product obtained by concentrating the water in which beef for canning is parboiled. It contains large amounts of meat extractives which stimulate the appetite, but its nutritive value is low. It is easily digested, quickly absorbed, and is valuable in the diet of the sick, convalescent and aged.

Beef Tea. A rich unfiltered soup stock, made by soaking finely ground beef in an equal weight of cold water to dissolve the protein, then gradually raising the temperature to near boiling point, after the liquid is drained off. A light stimulant, having small nutritive value. A pound of beef and a pound of water will make about one-half pound of beef tea.

Bisk (or Bisque). A thick rich soup usually made from meat or fish. Thick vegetable soups, such as tomato, are commonly referred to as bisks.

Blanch. To scald vegetables, nuts, etc., in order to remove the outside skins or hulls.

Bleaching Flour. Most hard wheat flour is artificially bleached, as this not only improves the color but is claimed to improve the quality of the gluten, or "age" the flour. Bleaching is authorized by law if not used to whiten an inferior flour and make it appear better than it really is.

Blending Flour. Practically all hard wheat flours are marketed as blends of different kinds of wheat in order to maintain a uniform standard for quality. It should not be necessary to mix soft wheat flour with the hard wheat flour purchased by the Quartermaster Corps.

Boiling. As applied to cooking, is heating or cooking in a boiling liquid.

Water boils at 212° F. at sea level. It simmers when the bubbles break beneath the surface—185° F. It is scalding hot at 150° F. or at a temperature such that the hand cannot be borne in it. Solids, as for example, sugar or salt, raise the boiling point of water. A solution having reached the boiling point, the temperature cannot be increased by any amount of additional heat, except under pressure, as would result from boiling in a closed vessel.

Lard smokes at 385° and boils at about 600° F. Hence it is evident that grease, even if not at the smoking or boiling point, may be much hotter than boiling water, a fact that should be borne in mind when handling it and when cooking with it.

Bouillon. Beef tea on a large scale. When served as soup, it is seasoned with spices, onions, celery, etc., all fat skimmed off and the stock clarified by straining.

Bouillon cubes are made from concentrated beef extract, vegetable extract, celery salt and common salt. The mixture is warmed until of the proper consistency, thoroughly mixed, rolled and cut into dice, and wrapped in tinfoil. One cube will make a cup of bouillon.

Bouillon cubes contain about 50% salt. They stimulate the appetite and aid digestion somewhat but have little food value. They should be stored in a cool place away from the light and should not be held longer than six months.

Bran. The outer coating of cereal grains. Wheat bran contains a large amount of mineral matter. It is suitable for occasional use in bread, rolls, etc., but should not be used too frequently because of its laxative effects.

Brains. A mass of nerve tissues inclosed in the skull. Brains from meat animals are saved for table use and have a limited food value. They are highly perishable and require great care in handling.

Braising. Method of combining the roasting and stewing of meat in a closed vessel with heat from both top and bottom, as in a Dutch oven. One of the best methods of cooking tough meat. If the vessel is placed in a slow oven, it requires little further attention.

Bread. The sound product made by baking a dough consisting of a leavened or unleavened mixture of ground grain with potable water and with or without the addition of other edible substances. In the United States the term "bread," unqualified, means white wheat bread.

a. *Garrison bread.* The type used in permanent stations, and in the field when it can be distributed within 48 hours. It has a light crust and the characteristic loaf shape.

b. *Field bread.* The type used in the field when distribution cannot be made within 48 hours. It has a thick crust, and hence retains its moisture and remains fresh much longer. The shape of the loaf is round with a hole in the center.

c. *Biscuit.* A kind of hard unleavened bread (hard bread) baked in round or square cakes; a substitute for fresh bread.

Broiling. Cooking by direct exposure to the heat of an open fire; also applied to cooking on an iron plate interposed between the fire and the article cooked. The fire should be clear and free from smoke. Charcoal should be used. It is better to broil before a fire than over it, in order to save the drippings and avoid a smoky flavor. The smoke from the fat itself is not as objectionable as that from coal or wood.

Buns. Small cakes or breads, generally round or oval shaped, and frequently spiced.

Cakes. Leavened or unleavened flour compositions, generally sweetened before baking.

Capers. Unopened buds of a trailing shrub grown in southern Europe. Pickled and much used in sauces. Caper sauce is frequently served with mutton.

Caramel. A brown substance with a characteristic flavor produced by scorching sugar. It is used to color sauces, flavor desserts, etc.

Caraway Seed. Seed of a garden herb. Used in various cakes and sweet crackers and in rye bread.

Carbon Dioxide Gas (Carbonic Acid). The heavy colorless and non-explosive gas produced by yeast when sugary solutions are fermented, or when baking powder or similar substances are mixed with a liquid. The application of heat within limits accelerates the formation of the gas.

Carbohydrates. Comprise the sugars, starches and syrups. They furnish most of the fuel and energy for the body. When eaten in excess, they may be converted into fat and stored in the body.

Casein. A protein found principally in milk. It can be solidified by a weak acid or by rennet. The latter is used in the manufacture of cheese.

Casing. A container for sausages. Casings are generally of animal origin, being made from the intestines and bladders of hogs, cattle and sheep. Occasionally casings are made from cloth and coated with paraffin to prevent the sausages from drying out.

Cassia. The dried bark of a tree which is grown in China and Indo-China. Used as a substitute for cinnamon, which it resembles, though lacking the fine flavor of high-grade cinnamon. Sometimes called "Saigon Cinnamon".

Celery Salt. A mixture of ground celery and salt in the proportions in weight of two to one. Much used in salads and seasoning.

Centigrade. A thermometer scale on which the zero is the freezing point and 100 the boiling point of water at sea level. A part of the metric system.

Chervil. A garden herb similar to parsley and much used in soups.

Chicory. The roasted and pulverized root of an herb. Occasionally used in adulterating coffee or as a substitute for coffee. If coffee containing chicory is dropped in water, the chicory will at once settle and be followed by a cloudy streak.

Chili or Chilies. A popular name for the red pods of several species of small, pungent peppers. Chili powder usually contains turmeric and other spices in addition to chili.

Chocolate. The solid or semi-solid product obtained by roasting and grinding cacao beans.

Chowder. A dish of stewed fresh or salt fish or clams, with vegetables and crackers added.

Chutney. An East Indian sweet pickle.

Cinnamon. The dried inner bark of the cinnamon tree which is highly prized as a spice. Grown principally in the island of Ceylon.

Citron. The candied spongy peel of a fruit belonging to the Citrus family and resembling the lemon in shape, though larger and milder in flavor. Used in mincemeats, preserves, cakes, etc.

Cloves. The dried flower buds of the clove tree. Whole cloves retain their flavor longer than ground cloves. The cloves of Penang are the most highly valued.

Cocoa. Chocolate deprived of a portion of its fat and then ground to a powder. Breakfast cocoa must contain not less than 22% cacao fat.

Coffee. A drink made by an infusion of roasted and ground coffee beans. To most persons it is a mild stimulant.

Condiment. Something to give relish to the food and gratify the taste. General term of seasoning.

Cracklings. The crisp residue remaining after lard or fat has been tried out. Sometimes used in corn bread. The remaining fat and characteristically piquant odor add a desirable flavor to preparations in which they are used.

Cream Bread. Bread baked in super heated steam introduced into the oven, or baked under inverted pans, insuring a thin crust of a light color.

Croquettes. A mass of finely minced and seasoned meat, fish, rice, or potatoes, etc., made into a ball or other regular shape, rolled in cracker crumbs and fried in deep fat until crisp.

Croutons. Cubes of toasted bread. Generally served with soup.

Crullers. Small cakes made from sweetened dough leavened with yeast or baking powder and fried in deep fat.

Crumb. The soft inner part of the loaf, as distinguished from the crust. Good bread is distinguished by fineness of cell wall, smallness and uniform distribution of the holes, and characteristic odor and flavor. The feel which is determined with the finger tips should be elastic, smooth and even. The color of the crumb is largely influenced by its texture. The color should be a warm white with a creamy tinge. In addition it should have a sheen when viewed from an obtuse angle, caused by the coagulation of soluble albumen into flaky masses.

Crust. The outside of a loaf, caused by the drying out, and chemical changes in the starch known as "caramelization". The crust should not be too thick, except for "field bread"; should have very fine holes. The feel should be brittle and crisp, not leathery, and the color should be a reddish brown. The sides should have good color without streaks. The color is influenced by the amount of sugar, malt, heat of oven, age of dough, etc.

Curry Powder. A yellow powder formed by mixing hot peppers, ginger, turmeric, and other spices. Used as a high seasoning for stews, etc.

Cutlets. A term usually applied to cuts from the round of veal; also, sometimes applied to the small pieces of pork from the cheek of the hog.

Deviled. Highly seasoned.

Deviled Meat. Cooked meat,finely ground and highly seasoned.

Diet. Proper quantities and suitable combinations of foodstuffs so as to meet all the requirements of the human body for nourishment. To be balanced, the soldier's diet should contain the necessary amounts of the following:

a. Protein—Meats, fish, eggs, etc.
b. Carbohydrates—Bread, potatoes, sugar, other starches and sweets.
c. Fat—Butter, suet, lard, vegetable oils, etc.
d. Bulk or Roughage—Leafy vegetables like spinach, cabbage, string beans, etc.
e. Mineral Matter—Present in proper quantities in fruits, vegetables, whole grain cereals, etc.
f. Vitamines—See "Vitamines".
g. Water.

Dough. A mixture of flour or meal and other ingredients for bread, cake, or pastry making.

Doughnuts. Small cakes made from a sweet dough and fried brown in a deep fat. May be made with either baking powder or yeast and with or without holes in the center.

Dredge. To sprinkle, as with pepper and salt, to rub in, as with flour, etc.

Drippings. The excess grease obtained from meats, fats, stocks, gravies, etc. It should be carefully preserved in a suet pan, strained and cooled for subsequent use in frying or for rolls and pastry, or for soap making.

Dry Shortening. This is a shortening prepared by the hydrogenation of vegetable oils. This hardened oil is then ground to a fine powder. It is readily miscible with flour and has excellent shortening properties.

Dumplings. Pieces of dough, sometimes with fruit or vegetables inclosed, baked or boiled. If served with meats or stews place in boiling hot beef stock for about 8 minutes before serving.

Eggs. Means hen's eggs unless otherwise indicated. Most deterioration of eggs is due to holding at a temperature about 60° F., or to bacterial action when the eggs are damp or dirty. Therefore, eggs should be kept clean and dry. Cold storage is the best method of preserving eggs, the ideal holding temperature being 31 to 32 degrees F. Excessive dryness causes eggs to lose their moisture by evaporation, while excessive humidity is favorable to the growth of mould, which is more detrimental to quality than shrinkage. The bacteria in the shells of eggs may be destroyed and the pores sealed by dipping them momentarily into hot mineral oil.

Entree. Small meats made in various guises, with sauce and garnishings, served between courses or at the beginning of a dinner.

Estragon or Tarragon. A garden herb used to flavor vinegar, soups, sauces, etc.

Extractives. Substances of low food value extracted from meat, vegetables, etc., during soaking and cooking process. They form the stimulating constituents of beef tea, bouillon, etc.

Fahrenheit. The thermometer scale commonly used in the United States, on which 32 marks the freezing point of water and 212 the boiling point.

Farina. A coarse flour or meal made from cereal grains or from the starch of vegetables. Sometimes farina is especially prepared for breakfast food.

Fat. Any part of animal or vegetable tissue which consists chiefly of cells distended with greasy or oily matter. The common fats are lard, butter, suet, and vegetable (cotton-seed, olive, peanut, corn, etc.) oils.

Fats may be either liquid, semi-solid, or solid, depending upon their several characteristics.

Fats produce fuel and heat for the body and at the same time improve the flavor and texture of the food. A certain amount of fat is necessary in most foods to prevent them from being dry and unpalatable. The actual amount of fat stored in the body varies according to the personal habits, occupation and idiosyncrasies, but in the average man it forms about 15% of the total body weight.

In cold weather fats assist in maintaining the body temperature and may be partaken of more freely than in warm weather.

Fennel. A common garden plant cultivated for its leaves, which are used for garnishing and flavoring and for food. It is most commonly used to flavor fish.

Ferment. That which is capable of causing fermentation. A change in the nature or a breaking up into other substances—usually alcohol and carbon dioxide.

Fermented Bread. Bread made with yeast or a true ferment, as distinguished from an unfermented bread, such as aerated bread, certain hard breads, unleavened bread, baking powder and baking soda preparations, etc.

Fillet. A strip of lean meat without bone.

Fillet of Beef. The tenderloin muscle, which lies beneath the backbone in the hind quarter. It is easily detached, and is used in steaks, and less frequently in roasts.

Fillet of Fowl. The breast.

Fillet of Pork or Mutton. A strip from the shoulder to the hip on either side of the back-bone.

Fillet of Rabbit. Fleshy parts of the back and legs.

Fillet of Veal. Pieces of the round, generally larded, stuffed, coiled and skewered into a round shape.

Flour. The clean sound product made by bolting the meal of wheat or other cereal grains. When used unqualified the term "flour" applies to wheat flour. Flour will keep for a year or more if stored in a cool, dry and well ventilated place. If kept more than six months it is liable to become weevil infested.

Frappé. A term given to water ices that have been only partly frozen. It is an iced drink and the name should not be given to a custard or a cream.

Fricassee. A dish of meat, as of fowl, cut into pieces, fried until partially done and stewed in gravy.

Fritters. A small quantity of batter usually inclosing or containing some other substances, fried in deep fat, e. g. corn fritters, apple fritters, etc.

Garlic. A bulb like an onion, with a strong characteristic smell and pungent taste. A clove of garlic means one of the natural subdivisions of the bulb. A favorite condiment of the people of southern Europe and of the Orient. It is occasionally used in organization mess cooking to "bring out" the flavor of other seasonings.

Garnish. To decorate a dish with something to make it more attractive, such as bordering salads with capers, parsley, beets, or lemons.

Gelatin. Glutinous material of low food value obtained from animal tissues. It readily dissolves in hot water, and forms a jelly upon cooling. While in the liquid state it may be given any flavor or color desired. Gelatin is an excellent cheap summer dessert, easily digested and much used in the diet for the sick.

Gems or Muffins. Hot breads made from white or graham flour or corn meal, and baked in gem pans.

Giblets. Liver, gizzard, heart, neck, feet, wings, etc., of poultry as used in pies, stews, sauces, etc.

Ginger. The washed and dried, or decorticated and dried, roots of a reed-like plant, cultivated in India, Ceylon, Malay Peninsula, Africa, West Indies, etc. Jamaica Ginger is grown in Jamaica.

Glace. Icing.

Glucose. (Corn Syrup). A term applied commercially to a syrup made by cooking corn starch with dilute sulphuric acid. Glucose is thick, almost white, will not crystallize, and is one-half to two-thirds as sweet as sugar (sucrose) syrup. For table use it is generally colored and flavored with other syrups and vanilla extract. While ordinarily cheap, it is very wholesome.

Gluten. Constitutents of wheat flour dough which enables the dough to expand, and thus retain the fermentation gases, are called gluten. Two elements of flour, distinct from each other in a dry state, unite upon the addition of water to form gluten. These two elements are gliadin and glutenin. The glutenin gives solidity and body to the gluten; gliadin gives it toughness and elasticity. If either of these elements is absent no gluten will be formed. For this reason light bread cannot be made from rye flour, as it contains no glutenin.

Graham Flour. Unbolted wheat meal, that is, flour made by grinding whole wheat and without extracting the bran or any other portion. Occasionally, a substitute graham flour is made by mixing bran, shorts and low grade flours. Such a flour is not so desirable as genuine graham flour.

Graham flour has a pleasing flavor and should be used occasionally to give variety to the diet. The outer bran of the wheat berry is almost pure silica (glass) and in passing through the system scratches the intestines, causing increased secretions, and consequently acts as a laxative.

Grilled. Broiled.

Grits. Grains, as of wheat, corn or oats, coarsely ground.

Gruel. Liquid food made by boiling meal or flour in water or milk.

Ham. Unqualified, this means the thigh of a hog. That portion of the shoulder of the hog when trimmed so as to resemble a small ham is known as "Cala" (formerly California Ham).

Ham Butts. Triangular shaped pork cuts made from the rear end of the side of a hog after short cut hams have been removed. Boston butts and boneless butts are those cuts made from the lean portion of the shoulders of hogs when "Calas" are made.

Hearts. The muscular organ which propels the blood. Being in almost continuous action, its fibers are firm and tough.

Beef hearts are the principal ones marketed fresh, sheep hearts and hog hearts being largely used in sausage manufacture. Hearts contain fair quantities of vitamines "A" and "B".

Hominy. Degerminated, hulled and cracked Indian corn. Lye hominy is made by treating selected whole grains of Indian corn in a hot solution of lye to remove the hulls after which all traces of lye must be removed. The product is then soaked and cooked until tender.

Hops. The cured, kiln-dried blossoms of the hop vine,—a perennial climbing plant. Hop tea is prepared by using about ½ to 1 ounce of hops to a gallon of water. After boiling and straining, the tea is used to assist in checking acetic fermentation incident to the alcoholic fermentation accompanying the yeast plant growth. Good hops are yellowish-green in color; poor hops, brown.

Ice. A general term frequently applied to frozen creams, custards and other desserts, as well as to water ices. The latter are fruit juices sweetened with sugar sirup and stirred while freezing.

Icing. A glazing or coating of sugar usually mixed with white of egg and suitable flavoring, as on a cake; frosting.

Ingredients. A general term describing the factors that constitute a substance. To illustrate, ingredients of bread include flour, water, yeast, salt, sugar, shortening, and in some instances, milk, hop tea or malt.

Jam. Is the sound product made from good fresh fruit and sugar, with or without spices and vinegar, by boiling to a pulpy or semi-solid consistency, conforming in name to the fruit used.

Jelly. Is the sound, semi-solid gelatinous product made by boiling clean, sound, properly matured and prepared fresh fruit with water and concentrating the pressed and strained juice to which sugar is added, conforming in name to the fruit used in its preparation.

Kidneys. Kidneys of lamb and mutton are usually cut up when the loins are cut into chops and remain a part of the chop. Beef and pork kidneys are the ones commonly found on the market. Beef kidneys are lobulated, while those of other animals are smooth. Kidneys contain considerable nourishment and are fairly rich in vitamines "A" and "B". Many kidneys have a persistent odor of urine, to remove which they must be prepared by slicing and soaking in cold water.

Lactic Fermentation. This is a fermentation characterized by formation of lactic acid and develops eventually in any dough, without a ferment, set in a warm place. The souring of sweet milk is occasioned by spore development causing lactic fermentation. A heavy lactic fermentation, obtained by adding a small quantity of milk, is sometimes very desirable as it helps to soften the gluten and adds a flavor pleasing to many people.

Lard. The unadulterated, rendered, fresh fat from hogs in good health at time of slaughter. Good lard is clean and free from rancidity.

Refined steam rendered lard is produced by the application of live steam under pressure direct to fats in closed tanks. It is bleached and filtered to give it a good, white color.

Open kettle rendered lard is produced from the highest grade fats in open kettles. It is cooled without agitation so as to make it have a crinkled top surface and a grainy appearance.

Leaf lard is rendered from leaf fat—internal fat from the abdomen of the hog. This lard is usually open kettle rendered and is high in price.

Lard Substitute. Shortening material prepared by mixing about 85% cottonseed, peanut, or other vegetable oils with about 15% of beef stearine. It is very popular with the housewife because when clean and sound it leaves no odor. It frequently costs more than pure lard. It is equally as satisfactory as lard for use in the company kitchen.

Leek. A species of onion having flat leaves. Much used in soups.

Lentils. A variety of bean cultivated in Southern Europe and the Orient, and used in making soup.

Lights. The lungs of meat producing animals. Used to some extent in cheap sausages.

Liver. A large, very vascular, bile secreting glandular organ of food animals sometimes used as food. Calves' liver is considered the best, beef liver second, and hog liver third. The liver of mutton is dry and tasteless. Liver contains considerable nourishment and is fairly rich in vitamines "A" and "B".

Macaroni. A strong flour made into a stiff dough, pressed into long tubes and dried by slow heat.

Mace. Is the dried outer coating of the nutmeg, grown in the East and West Indies.

Marrow. Obtained from the long bones, particularly those of beef. It is almost wholly fat and can be used for any purposes for which beef fat is prescribed.

Mayonnaise. A sauce for salads, prepared from the yolks of eggs, mustard, olive oil, lemon and salt.

Meringue. A delicate composition chiefly of powdered sugar and the beaten white of eggs, used as icings on puddings, fruits, pies, etc., or made into small cakes and baked; also a small cake baked of this.

Milk. Milk is the whole, fresh, clean, lacteal secretion of healthy cows properly fed and kept, excluding that obtained within fifteen days before and five days after calving, or such longer period as may be necessary to render the milk practically colostrum-free.

Fresh whole milk is practically a balanced and complete diet, especially for infant animals. For adult use it is too bulky when used alone and is deficient in iron. It contains on an average of 3.5% of milk fats, 3.5% of proteins, 5% of carbohydrates, 0.7% of mineral substances and 87.3% of water.

Condensed milk is whole milk concentrated by the evaporation of water in the ratio of about 2½ parts of whole milk to 1 part of condensed milk. Unsweetened condensed milk is usually referred to as evaporated milk and is marketed in sealed tin containers, being preserved by sterilization with heat after canning. Sweetened condensed milk is not sterilized by heat but is preserved by the addition of considerable amounts of sugar. Evaporated milk sometimes shows separation of butter fat or a slight thickening. Sweetened condensed milk may also show considerable separation of sugar but this is mechanical. As long as the flavor of either kind of condensed milk is unimpaired and it does not curdle when used in coffee, it may be considered as satisfactory for use, although milk recently canned and in perfect condition is preferred.

Dried milk is made from whole milk by reducing the moisture content by evaporation to about 3%. Cream and skim milk are also dried.

Malted milk is a composition of dried whole milk and the liquid obtained from a mash of barley-malt and wheat-flour, with or without the addition of sodium chloride, sodium bicarbonate and potassium bicarbonate, and dried to about 3½% moisture content.

Milling. The process by which wheat or other grains are converted into flour and other products.

Mint. An aromatic herb used in cooking. Mint sauce—Chopped green mint, vinegar, and sugar, mixed. Served with mutton, either hot or cold.

Mousse. A frozen dessert of frothy texture made of sweetened and flavored whipped cream, sometimes with addition of egg yolk and gelatin. Mousse differs from ice cream in being beaten before—not during—the freezing process.

Mulligatawny. A highly seasoned soup.

Mustard. The ground seed (flour) of the mustard plant from which part of the natural oil has been removed. Bright yellow mustard usually contains tumeric. Wet mustard is prepared by adding salt, spices, and vinegar to the mustard flour.

Noodles. A strong flour made into a stiff dough, pressed into long ribbons and then dried by slow heat. Eggs or other ingredients are frequently added.

Nutmeg. The kernel of the fruit of the nutmeg tree grown in the East and West Indies. One of the common spices.

Oleomargarine. A name given to a manufactured substitute for butter. It is usually composed of oleo oil, neutral lard and vegetable oils, "churned" or emulsified with milk. The emulsified fats and oils are then crystallized by contact with cold water, after which they are tempered, worked, salted and packed much the same as butter.

Oleomargarine has a fuel value approximately equal to that of butter. It lacks true butter aroma and appeal to the appetite. When made from beet fats it contains a fair amount of fat soluble vitamines.

Oven, Quick. One heated to a temperature above 385° F. An oven of less than 12 counts.

Oven, Slow. One heated to a normal baking temperature—below 385° F. An oven of more than 15 counts.

Oyster Plant (Salsify). A white root having the flavor of an oyster. It is best in the spring of the year after the frost is out of the ground. It is generally left in the ground over winter.

Pancreas. A digestive gland from near the stomach of meat animals. Sometimes sold as stomach sweetbreads.

Parker House Rolls. Rolls made from a sweet dough.

Parsley. A green herb much used for garnishing and in flavoring soups, stews, croquettes, etc.

Pastry. Food preparations made from a paste, or of which the crust is so made, such as cakes, pies, jelly rolls, lady fingers, cookies, plum duff, etc. Sugar, butter, eggs, baking powder and extracts are generally employed in their preparation.

Parboil. To cook partly by boiling.

Patties. There are two distinct kinds of patties. First, a puff paste shell baked and afterwards filled; second, small pies made by lining patty pans with short paste, filling with oysters, chicken, etc., covered with crust and baked.

Pepper. *Black pepper* is the dried, immature berry of a woody vine plant cultivated in tropical countries.

White pepper is produced by removing the outer black covering from the black pepper berry.

White pepper does not show black specks and is more expensive. Black pepper is the most pungent and therefore better for flavoring.

Pepper, Cayenne. The ground pods and seeds of small, pungent red peppers.

Piccalilli. A sweet pickle made by grinding together cucumbers, onions and green tomatoes.

Poach. To cook in a small amount of water or milk. A term generally applied to eggs.

Porridge. A gruel.

Potatoes. A tuber having a heavy starch content. About 3½ bushels of potatoes are consumed annually in the United States by each individual.

Protein. A nitrogenous substance necessary in the diet to replace muscular waste and build up tissue. The principal sources of protein are lean meats, fish, white of eggs, milk, cheese, kidney and liver.

Proving. A gradual rising or expansion of dough or sponge, due to the formation of carbonic gas incident to the growth of the yeast.

Ragout. A highly seasoned meat stew.

Rendering. The process of separating lard or suet from the tissues containing it.

Roasting. Cooking before an open fire; also applied to baking in a dry chamber, with free air circulation. Certain flavors are developed in roasting before an open fire that are closely approximated in a well ventilated oven and which cannot be approximated in a closed oven.

Saccharin. A white crystalline, coal-tar product, about three hundred times as sweet as sucrose.

Rye Flour. A flour made from rye. It contains no gluten, hence, will not rise in baking, and consequently should generally be mixed with wheat flour. From a nutritive standpoint, it is practically the same as wheat.

Saffron. The petals of a flowering plant of deep orange color. Used mostly in flavoring soups.

Sage. A plant with grayish green leaves and much used in seasoning meats and stews.

Salsify. Oyster-plant.

Salt. A colorless or white crystalline substance chemically known as sodium chloride. It renders foodstuffs palatable and is an important blood constituent.

Sago. Nearly a pure starch made from the pitch of the Sago palm tree grown in the East Indies. It is cooked in much the same way as tapioca; also much used in soups.

Sausage. Finely divided meat or meat products, flavored with spices and condiments, to which cereal and water may or may not be added:

Fresh sausage, such as pork sausage, is made from pork trimmings.

Cooked and smoked sausages, such as Bologna, Frankfurters, etc., are made from combination of beef and pork trimmings.

Dried sausage includes all summer sausages or that which is smoked and then dried to improve its keeping qualities.

All cheap sausages contain large proportions of meat products (hearts, tripe, lungs, ox lips, etc.). The better grades contain little or no products.

Sauté. To fry in a shallow pan with but little fat—first on one side and then on the other.

Scald. As applied to flour, potatoes, etc., to submerge or wet with water at a temperature of 160° F., or more—sufficiently hot to dissolve the cell walls and expose the starch grains to the action of the yeast plant.

To scald utensils, etc., to dash over with boiling water.

Scallop. A mollusk similar to an oyster. Corrugations in the shell radiate from the center.

Scalloped dishes—Dishes made in the form of a scallop shell.

Scalloped Oysters. Oysters rolled in bread or cracker crumbs, mixed with batter, then sprinkled with salt and pepper and baked.

Self-Raising Flour. The so-called "Self-raising" flours are composed of flour—made of wheat or some other cereal, or a mixture of cereals—and baking powder in proper proportion to produce carbonic gas sufficient to aerate the mixture desired. The best that can be claimed for them is that they save the cook the time used in mixing the flour and baking powder.

Sherbet. A water ice made from the juice of fruits diluted, sweetened, flavored and frozen.

Shortening. Any edible fat or oil, such as lard, lard substitute, butter, suet, etc., mixed in a dough to make it more friable or easily crumbled.

Slaw. Sliced cabbage seasoned with vinegar, salt, and pepper. It may be served cooked (hot or cold) or raw.

Soda. A white alkaline compound (sodium bicarbonate), consisting of a white powder or dry transparent crystals. Sometimes used to neutralize acids found in sour dough; also used to manufacture baking powder, or alone in the preparation of certain mixtures in the kitchen.

Soufflé. A fluffy side dish containing milk, eggs, flour, butter, etc., and flavored with cheese or chocolate or various fruits. It should be served hot.

Spaghetti. See "Macaroni".

Spare Ribs. Ribs of pork with but little flesh attached.

Sponge. A thick batter of dough, made from flour, water and yeast. It is the first step in the process of bread-making.

Starch. A carbohydrate,—in a pure state it is white, odorless, tasteless and insoluble in water. In the United States most of the edible starch is obtained from corn; in Europe from the potato. Starch exists in most plants, cereals and vegetables. Other starches used for cooking are cassava, arrow-root and tapioca. Starch is a good food and is used extensively in puddings for thickening purposes, etc.

Sterilize. To destroy harmless or disease-bearing bacteria. Kitchen utensils are generally sterilized by the use of boiling water to which lye is sometimes added. The sterilizing of all utensils used in handling yeasts and doughs is absolutely necessary in order to prevent spoilage.

Stock. The liquid or jelly obtained by boiling meat, bones, etc., for several hours in water. It is the basis of all good soups.

Succotash. A mixture made by cooking green corn and hulled green lima beans, in the proportion of four parts corn to one of beans.

Suet. The large folds of fat found attached to the inner walls of the hind quarters of the beef.

Sugar. (Sucrose). A white crystalline carbohydrate soluble in water. Usually obtained from the sugar beet and from sugar cane. Commercial granulated sugar is 99.8% pure and there is no difference between cane sugar and beet sugar from a chemical and cooking standpoint.

Corn sugar is made by cooking corn starch in a diluted sulphuric acid solution until the liquid solidifies. This sugar has a slight yellow cast and does not crystallize, but it can be broken up into small round particles resembling somewhat sugar crystals. Corn sugar is only about one-half to two-thirds as sweet as cane or beet sugar.

Sweetbreads. The thymus gland of meat animals. They have very little natural flavor, but are tender and considered a delicacy. Those from the calf are the best; the next best are from the beef, sheep, and hog, in the order named.

Tallow. The fat of beef, sheep, or other animals, from which a portion of the oil has been extracted, making it harder than the natural fat.

Tapioca. A starch extracted from the roots of a South American plant. Used in puddings. Very similar to sago and arrow-root.

Temperature. A condition that pertains to heat and cold; the relative degree of each. Temperature is a most important factor in cooking and baking. Water boils at 212° F. at sea level. The temperature of a quick oven is from 385° F. and up, and that of a slow oven from 385° F. and down. Grease boils at 565° F. to 600° F. and smokes between 385° to 450° F. The latter are the temperatures at which grease is usually employed in cooking. Bread is baked at approximately 385° F., but may be baked between 300° F. to 450° F.

Thermometer. A device for determining the exact degree of heat or cold. The Fahrenheit thermometer registers freezing at 32° and boiling at 212°, whereas the Centigrade registers these points at 0° and 100° respectively.

Thyme. An herb used in seasoning.

Thymus Gland. See sweetbreads.

Tripe. A product made from the stomachs of cattle. That from the first stomach is called "plain tripe"; that from the second stomach, "honeycomb tripe", because the peculiar arrangement of the mucous membrane of the second stomach makes it resemble honeycomb. Hog's stomachs are sometimes prepared as "hog tripe".

Vinegar. A product resulting from the acetic fermentation of alcohol in cider (cider vinegar), dilute whiskey (spirit vinegar), wine (wine vinegar), beer (malt vinegar), etc. According to Federal standards vinegar must contain at least 4% acetic acid, though in actual practice it may contain as much as 10%. The remainder is water and a small quantity of other products which are characteristic of the substances from which the vinegar is made.

Vitamines. Recently discovered but very important food factors that are essential to normal growth and maintenance of good health.

Nutrition experts at present agree upon the presence of three vitamines known as fat soluble "A", water soluble "B", and anti-scorbutic "C", but as yet those vitamines have not been separated from the foodstuffs in which they are normally present.

Fat soluble "A" vitamine is present in butter, whole milk, cod-liver oil and, to a lesser extent, in beef fats, etc.

Water soluble "B" vitamine is widely distributed, being present in varying amounts in most fresh fruits and vegetables and large amounts in peas, beans, and whole grain cereals and flours. Fancy patent flours, polished rice, etc., and highly milled cereals lack this vitamine and when used extensively should be supplemented by foods rich in it. Beef liver, hearts and kidneys are very rich in vitamine "B". Lean meats are fairly rich in it.

The anti-scorbutic "C" vitamine occurs mostly in fruits and particularly in oranges, lemons and grape-fruit, though a few fresh vegetables like tomatoes, cabbage and lettuce are rich in it.

Vitamines "A" and "B" are not greatly affected by cooking, while vitamine "C" is readily destroyed by cooking, hence the necessity of frequently eating green fruits or of making cole slaw or uncooked salads from lettuce, cabbage, etc. With acid products like canned tomatoes, vitamine "C" is not greatly affected by heat; hence, they should be frequently used when fresh tomatoes or other fresh vegetables are not available. The lack of foods which contain these vitamines will eventually cause eye trouble, nervous disorders or scurvy or combinations thereof, so the necessity of including fresh milk, butter and fresh vegetables in the soldier's diet becomes readily apparent.

Wheat. A small grain grown throughout the world. It varies in characteristics and bread-making qualities according to the variety as well as the climate and soil of the place where it is produced. Its great claim to distinction is that two of its proteins form gluten when mixed with water and thus makes possible the manufacture of light, spongy bread from wheat flour.

Whole Wheat Flour. See "Graham flour".

Yeast. Generally, a certain class of fungi; specifically, the culture of certain types produced under controlled conditions and used principally for fermenting bread, sugar solutions, etc.

CHAPTER XX

PUBLIC PROPERTY

Introduction. The subject of public property, commonly mentioned as "government property", covers a broad field. Supplying all units of the Army with every article of equipment and supply at the precise time and place needed so as to assure efficient accomplishment, requires carefully standardized methods and the application of sound business principles.

All personnel of the Medical Department should see to it that *full value* is derived from all government property utilized. Waste or the extravagant use of supplies must be avoided. Economy should be the watchword. Many articles of equipment can be kept serviceable by timely repair, and every medical soldier has a direct responsibility in salvaging material still useful.

In checking property lists always report a *surplus,* as it can mean but one thing—that someone else is *"short"* what you are ahead. This applies particularly to checking up ward equipment where frequent laundry exchanges, especially as regards bedding, are apt to create these conditions.

In placing new stock on shelves in storerooms always so arrange it that the old stock on hand will be issued first. Particular care must be exercised in storing deteriorating items, such as rubber goods. They require frequent inspection and overhauling.

Lastly, don't "inflate" your requisitions. Anticipate only your normal expectancy of need, and don't resort to the practice of "playing safe" by asking for quantities you will probably never require. By doing so you may be depriving some other formation or establishment of its equitable share of certain supplies which may at the time be available only in limited quantities.

Accountability and Responsibility. Accountability for public property devolves upon any person who has in his possession property in storage, or for issue, and who is required to maintain a property account thereof.

A person is *responsible* for the care and preservation of property when he holds it on memorandum receipt. He does not maintain a stock record account therefor, and consequently is not *accountable* for the property in his possession.

General responsibility for the care and safekeeping of public property devolves upon all officers concerned.

The commanding officer is responsible for the security of all public property of the command and has pecuniary liability, together with the property officer, for the strict observance of regulations in regard to its preservation, use and issue.

The commanding officer requires property officers to take an inventory, in person, of all property for which they are accountable, except that held on memorandum receipt, at least once a year.

Responsible officers (those holding property on memorandum receipt) are required to inventory such property at least every six months.

Sales articles in salesrooms are inventoried monthly.

In each case where the inventory balance does not agree with the stock record balance the necessary vouchers such as over, short and damage reports, and reports of survey are prepared.

The surgeon of each station is required to render a report to The Surgeon General on June 30 and December 31 of the money value of Medical Department supplies and equipment issued and services paid for from Medical Department funds, for use of the regular army during the preceding six months.

Supply Officers. A supply officer for each branch of the service is designated for each station and maintains property accountability records.

An organization supply officer for a regiment, battalion or similar organization is also appointed and accountable for and maintains a record of all articles of equipment "A" and "B" "Tables of Basic Allowances" of his regiment, separate battalion, etc., except articles of clothing issued and charged to enlisted men.

Such property as is carried by organization supply officers is obtained by requisition and the usual means of transfer (shipping tickets).

Property Records. A complete record of all articles of Government property under accountability is made on stock record forms, showing quantities on hand, on order, received or issued. This record is kept on W.D. QMC Form 58, or an authorized modification.

Vouchers to the stock record account, such as requisitions, shipping tickets, survey reports, and inventory and inspection reports, on which property is taken up or dropped from the account are numbered serially for each fiscal year, separate series of numbers being used for debit and credit vouchers. Such vouchers are filed numerically, debit and credit vouchers separately.

Non-expendable property issued by an accountable officer for use within the command, except clothing, is carried on memorandum receipts, signed by responsible officers; accountability for such property does not change.

In order that the quantity and location of property issued on memorandum receipt may at all times be known, there is kept at each station and by each organization supply officer a general record or account of such property and current transactions relating thereto. (This record is designated "Account of Property on Memorandum Receipt," W.D. QMC Form 35.)

The general account shows the quantities and location of articles issued to individuals and organizations.

The individual account consists of the memorandum receipts furnished by the individual or organization, and is kept on memorandum receipt W.D. QMC Form 74.

No formal returns of property are required by any branch of the War Department, but chiefs of supply branches are authorized to require the rendition of stock reports or duplicates of stock records. The Surgeon General requires medical supply officers to submit annual reports as of December 31 of all medical supplies and equipment on hand.

Property accounts are audited at irregular intervals by property auditors, under the general direction of the Chief of Finance, and usually detailed by corps area commanders. Certificates of audit are issued by the auditing officer upon the completion of the audit, one copy being forwarded to the corps area commander, one copy to the officer whose accounts were audited, and one copy to the Chief of Finance.

Accounting for Property in Time of War. In time of war, accounting for property of all kinds in hand and issued in the theater of operations ceases. The organization commander *receipts* for the supplies or materials with a notation showing the organization or work for which they are to be used. When an organization passes out of the theater of operations, the commanding officer causes a complete inventory of all property on hand to be made by a disinterested officer and a new account to be prepared.

Classification of Property and Equipment. *Expendable property* consists of articles consumed in the maintenance and upkeep of the service, articles such as spare and repair parts and components which are issued to repair articles which are attached to and become a part of a building, and materials used in manufacture and experimental purposes. Such property when issued by a property officer is dropped from accountability.

Each Supply branch issues lists of articles which are designated as expendable. The Medical Department Supply Table indicates what items are expendable.

Non-expendable property comprises all other articles. Such property can not be dropped from accountablitiy without formal transfer or property voucher.

Table ware, kitchen utensils, china and glassware of QMC issue when lost or damaged through carelessness are charged to those who are responsible for the loss or damage. The allowance for unavoidable breakage of china and glassware is 20% annually, 5% quarterly, of the total value of the allowance for an organization.

Such supplies as china and glassware are dropped from accountability upon the certificate of the responsible officer. Articles lost or stolen should be surveyed and the responsibility fixed therefor.

Classification of Equipment and Supplies. Tables of Basic Allowances prescribe the list of articles constituting the equipment of officers, enlisted men, and organizations.

Tables I, II and III prescribe the basic allowance of individual and organization equipment of common application to all branches of the service.

Table I prescribes the basic allowance of equipment and clothing issued to the individual enlisted man.

Table II prescribes the basic allowance of equipment pertaining to the individual enlisted man, squad, or detachment, not normally taken when the individual makes a permanent change of station.

Table III prescribes the basic allowance of organization equipment common to more than one arm of the service.

Table I lists the articles of clothing and equipment as "Equipment A" and "Equipment B," which are often referred to in property administration.

Equipment A constitutes the "*war set*" required by every enlisted man for war service.

Equipment B comprises additional articles for use at posts, camps and stations.

Table IV, published in separate circulars, prescribes the basic allowance of equipment special to the several branches of the service.

Table V shows an allowance of equipment and supplies exclusively for station use and for established permanent camps. Complete Equipment Tables for all units are prepared in accordance with the principles and allowances set forth in Tables of Basic allowances.

Classification of Medical Supplies. The several supply branches of the Army issue Supply Tables of Equipment and Allowances. The Supply Table of the Medical Department is published in pamphlet AR 40-1710.

Articles on the Medical Supply Table constitute the *standard medical supplies;* those not on supply table are known as *non-standard.* Standard medical supplies are divided into classes and sub-classes as follows:-

Class 1. Drugs, chemicals, laboratory stains:-
Item numbers 10010 to 15045.
Biological products:-
Item numbers 16010 to 18290.
Class 2. Surgical dressings:-
Item numbers 20010 to 20420.
Class 3. Surgical instruments and assembled cases:-
Item numbers 30010 to 35620.
Surgical appliances, miscellaneous diagnostic instruments and surgical supplies:-
Item numbers 36010 to 38870.
Class 4. Laboratory equipment and supplies:-
Item numbers 40010 to 44910.

Class 5. Dental equipment and supplies:-
Item numbers 50010 to 57040.

Class 6. X-Ray equipment and supplies:-
Item numbers 60010 to 62160.

Class 7. Furniture:-
Item numbers 70010 to 71010.
Physiotherapy equipment:-
Item numbers 71050 to 71303.
Hospital linen and bedding:-
Item numbers 71505 to 71780.
Mess equipment and supplies:-
Item numbers 72010 to 74330.
Cleaning and preserving equipment and supplies:-
Item numbers 74510 to 74950.
Stationery and miscellaneous office equipment and supplies. Blank forms – Medical Department.
Item numbers 75010 to 76700.
Occupational therapy equipment:-
Item numbers 76750 to 76950.
Miscellaneous hospital equipment and supplies:-
Item numbers 77010 to 79550.

Class 8. Veterinary equipment and supplies:-
Item numbers 80010 to 81360.

Class 9. Field equipment and supplies:-
Item numbers 90010 to 99810 and upwards.

Items of each class are numbered consecutively and alphabetically, beginning with 10010, 20010, etc., as they appear on an alphabetical list.

Equipment and Allowance Table of Standard Medical Supplies. The Medical Supply Table is a table of standard medical supplies of *expendable* and *non-expendable* items and gives the replenishment allowance of expendable supplies for each station of the Army for 6 months in the case of certain deteriorating supplies, and 12 months for all other supplies.

Expendable items appear in small type; non-expendable items in large type as far as the colon; deteriorating items are marked by the figure (1) just preceding the colon in the item name.

The allowance represents an equipment as well as a replacement amount required for fair wear and tear. A station requiring so many cups or sheets to equip and operate it over a certain period will obviously not require a total replacement each requisition period.

Corps area surgeons determine the overhead or replacement factor from the quantities (quoted) on hand, consumed and required, as appear on requisitions.

The quantities authorized represent for each item an amount sufficient for a six months period for deteriorating items (stock replenished quarterly) and for a twelve months period for all other items (stock replenished semi-annually).

The authorized allowance includes the quantities required to treat the average number of civilians entitled to medical treatment.

The allowance for the dental and veterinary services is shown directly under each item in its respective class. Class 5, Dental Equipment and Supplies, Item numbers 50010–57040, includes only those items which are peculiar to the dental service, and Class 8, Veterinary Equipment and Supplies, Item numbers 80010 to 81360, only those items peculiar to the veterinary service.

Both of these services obtain those items used in general, such as drugs, surgical dressings, etc., from the other classes.

The amounts required by the dental and veterinary services are consolidated with the medical service requirements, so that only one total appears on each requisition.

Stations outside the Continental limits of the United States are not classified.

An allowance for a corps area laboratory is entered separately. The allowance of Class 1 and 2 supplies for a general hospital is also entered separately.

Stations in the United States are classified either on the basis of military or animal strength, or on the basis of beds for men and stalls for animals, and are grouped in the supply table alphabetically by corps areas, which determine the amount to be asked for on requisition.

Branch Responsibility. The Medical Department is responsible for the procurement, storage, and issue of medical, dental, and veterinary supplies and equipment.

The surgeon of each station or command designates one Medical Department officer as medical supply officer, who becomes the accountable and responsible officer for the Medical Department supplies at that station or command.

The classification, nomenclature, and item numbers prescribed in the Supply Table of the Medical Department are employed in preparing all papers pertaining to standard medical items.

General Requisitions. Requisitions for supplies and equipment pertaining to any of the supply branches are ordinarily made on W.D. QMC Form 47.

Replenishment of organizational equipment (Articles of Equipment A and B, Tables of Basic Allowances, except chargeable to enlisted men's clothing money allowance) should normally be obtained through the organizational supply officer who obtains these articles from the station supply officer.

The supply branches of the Army are responsible for the maintenance of sufficient stock of spare parts, repair materials and tools to permit timely repair or replenishment of articles of equipment issued to troops.

Separate requisitions are prepared for supplies stored and issued by the different supply branches.

Requisition for Medical Supplies. Requisitions are prepared by the medical supply officer of the station after obtaining from the chief of each service of the Medical Department at his station a list of the supplies required for the period covered by the requisition.

These lists are consolidated and data thus obtained used in conjunction with the amounts of stocks already on hand in determining the amounts to be requested; such amounts, however, must not exceed the authorized allowance for the particular station as shown on the Supply Table of the Medical Department.

From time to time as supplies are issued to the different services, the medical supply officer keeps the officer concerned advised as to the quantity of stock on hand, in order that excess expenditures of the authorized allowance may be avoided.

Requisitions are submitted in triplicate. Requisitions for Medical Department blank forms are submitted on W.D. QMC Form No. 47, only one copy being forwarded.

All requisitions from stations under the jurisdiction of a corps area or department commander are forwarded so as to reach the corps area or department surgeon within five days after the beginning of the requisition period. All requisitions from independent stations (except General Hospitals) are forwarded direct to The Surgeon General.

All semi-annual (except blank forms) and quarterly standard requisitions from general hospitals are submitted direct to the respective issue depots. Semi-annual requisitions for blank forms, quarterly non-standard, and emergency requisitions from general hospitals, are forwarded direct to The Surgeon General.

When necessary, department and corps area surgeons and the commanding officers of general hospitals are authorized to forward emergency requisitions for *biological products only* direct to their issue depots, one copy of the requisition, showing action taken, being forwarded to The Surgeon General.

The data required are shown in minute detail on each requisition, including the code number of the station, to enable the approving authority to act thereon.

All requisitions are numbered serially, a new series being started at the beginning of each calendar year.

Separate requisitions are submitted for *non-standard* items upon which the items are listed by class alphabetically, each item being followed by a brief description or the catalogue number and other brief data. In case of spare parts for an item, care is taken to properly describe the part requested, stating the name, manufacture, and the type of the item for which the part is intended. When electrical equipment or parts for such equipment are asked for the type of current and voltage (with cycle and phase if alternating current) should be stated.

Each requisition is signed by the medical supply officer and approved by the surgeon, or, in the case of a general hospital, by the commanding officer.

Requisitions from posts, camps, and stations are designated as "Semi-annual," "Quarterly Standard," "Quarterly non-standard," and "Emergency."

Semi-annual Requisitions. From all camps, posts, and stations these are submitted March 31 and September 30, and include all standard items (except deteriorating items) and blank forms for the period covered.

The semi-annual requisitions are for sufficient stock to meet the requirements of the station for the next twelve months and are based on population entitled to medical treatment, including animals entitled to treatment; or bed capacity.

Quarterly Requisitions. From camps, posts, and stations these are submitted on the last day of each quarter, i. e. March 31, June 30, September 30, and December 31. One requisition is submitted for *standard* items and one for *non-standard* items required during the quarter covered.

The standard items requested consist of deteriorating items only, as designated in the Medical Supply Table, and the standard biological products also listed in the same table.

The quantity requested should be sufficient to meet the requirements of the station for the next six months and also be based on population entitled to medical treatment, and animals entitled to treatment; or bed capacity.

The standard biological products, with the exception of smallpox vaccine, remain potent and suitable for use when kept at ice-box temperature until the expiration of the time limit noted on the container. Vaccine virus remains potent indefinitely if kept at a temperature of from 0 to 10° F., but deteriorates within a comparatively short time if kept at ordinary ice-box temperature. For this reason, an automatic monthly supply is authorized for all stations.

The requisition for smallpox vaccine states thereon the total amount desired and the amount which will be required during each month of the issue period. The amount so stated is forwarded automatically each month from the issue depot.

The quarterly non-standard requisitions include such non-standard items as may be required for the quarter.

In addition to the data required, requisitions for non-standard items are accompanied by a letter of transmittal stating in detail the necessity for each item, and if the supply table contains one of similar type or character, full information why the standard item will not suffice.

Emergency Requisitions. These are submitted only when the necessity for the supplies is urgent, and are accompanied by letter of transmittal signed by the surgeon, giving full details as to the emergency.

Requisitions on the Army Medical School (quarterly) are forwarded direct to the Commandant, Army Medical School, Army Medical Center, Washington, D. C., without reference to department, corps area or district surgeons or to The Surgeon General, for items so indicated in the Medical Supply Table.

Such biological products as may be required in an emergency are obtained by emergency requisition forwarded in the same manner.

Requisitions on department or corps area laboratories (quarterly) are forwarded direct to the commanding officer, department or corps area laboratory, without reference to department, corps area or district surgeon or to The Surgeon General, for items so indicated in the Medical Supply Table.

Such of these supplies required in an emergency are obtained by emergency requisition forwarded in the same manner. If the situation is sufficiently urgent local purchases (e. g. Diphtheria antitoxine) may be made and full report as to the necessity for such action forwarded.

Antirabic Vaccine is asked for by telegraph direct to the corps area or department surgeon, stating in each instance the number of individuals to be treated.

Medical Books and Journals. Library units of standard medical books, suitable for the various camps, posts and stations are designated from time to time by The Surgeon General. Additional medical books are furnished medical units without requisition. Suggestions relative to new text books to be placed upon the standard list are submitted to The Surgeon General, through proper channels, by letter and not by requisition.

Subscriptions to medical journals are furnished in like manner.

Action on Requisitions. Requisitions of camps, posts, and stations under corps area or departmental control are forwarded in triplicate to the corps area or department surgeon who, after acting upon the requisition, returns one copy to the requisitioning office (showing thereon the depot of issue and amounts approved, etc.), forwards one copy to the depot designated to make the issue, and retains one copy in his own files.

All copies for non-standard items and all emergency requisitions, except for biological products authorized for issue, are forwarded by the corps area surgeon by indorsement to The Surgeon General. Requisitions for blank forms are forwarded to the issue depot.

Medical supply officers at issue depots (including Army Medical School and corps area laboratories) fill emergency requisitions and the quarterly standard requisitions, as promptly as possible.

Semi-annual and non-standard requisitions are filled and shipped as rapidly as emergency work will allow, but the supplies must reach the consignee not later than three months from date of requisition.

Therefore, if the medical supply officer has complied with the requirements regarding filling of requisition, all camps, posts and stations will receive the supplies before their stock is exhausted; having three months' supply of deteriorating articles and biological products, and six months' supply of all standard items on this date.

The Commandant of the Army Medical School, and the commanding officers of corps area and department laboratories modify requisitions submitted direct to them from posts, camps and stations.

Spectacles. Medical officers *prescribe* spectacles required for the correction of the visual defects of military personnel; but, except when such defects are due to violence suffered in the performance of duty, the Government will not *supply* spectacles for their correction. When spectacles are required for the correction of visual defects due to violence suffered by an officer or enlisted man in the performance of duty, application for authority to purchase them at public expense is made to The Surgeon General, or, if serving beyond the continental limits of the United States, to the surgeon of the forces there on duty, with a history of the case and an estimate of the cost of the required spectacles.

Transfer of Property. Public property is normally transferred through the medium of shipping tickets, (W.D., QMC Form 62), prepared by the shipping officer and forwarded in duplicate to the receiving officer, who checks the quantities listed on the shipping tickets, enters the items on his stock record account, returns one signed copy of the shipping ticket to the shipping officer, and files one as a voucher to his stock record account.

Separate shipping tickets for property of the several supply branches are used, the property being listed thereon alphabetically or numerically, according to the approved classification.

Shipment of Property. An officer making a shipment lists the property on four shipping tickets, forwarding two to the consignee, one to the finance officer of the corps area in which consignee is serving and files one as a temporary voucher to the stock record account, pending the receipt of the signed copy from the consignee.

When initial issues of Equipment A and B are made, three copies of the shipping ticket are prepared; one being presented to the organizational supply officer; one to the finance officer of the corps area, and one, being receipted by the officer who receives the property, filed with the stock record account.

Property purchased locally is entered on receiving reports, two being forwarded to the finance officer making payment and one copy filed with the stock record account.

Issue of Clothing. Clothing when required is normally issued in bulk to the unit commander once each quarter. Separate requisitions should be prepared for that chargeable to enlisted men and that constituting equipment. When clothing chargeable to enlisted men is required in bulk, requisition for clothing in bulk, W.D. QMC Form No. 51, in duplicate, being approved by the commanding officer, is forwarded to the quartermaster, who gives notice to the company or detachment commander when the clothing is ready for issue.

The company commander and the quartermaster or his representative certify on both copies the fact of receipt and issue, and the articles are then removed from the quartermaster storehouse. The clothing is at once issued to the enlisted man, the issuing officer entering on the request (Individual clothing slip, W.D., AGO Form No. 35) submitted by each enlisted man, the quantities issued, initials the slip and obtains the man's receipt at the time of issue. He then enters the articles on the individual clothing record, W.D. AGO, Form No. 32.

Clothing not actually issued should be returned to the quartermaster at once. Clothing required by individual enlisted men is entered on individual clothing slips, in duplicate, on which the quartermaster makes direct issue, the original being retained by the quartermaster and the duplicate returned to the company or detachment commander in a sealed envelope. The company commander immediately enters the articles on the individual clothing record.

Fuel, forage, gasoline, oil, etc., are issued as needed in daily issue tickets against requisitions for this class of property made out monthly in advance. The supply officer totals the tickets at the end of the month and enters the amounts on stock record cards.

Transfer of Property Accountability. In ordinary cases, property is transferred through the medium of shipping tickets. When a complete transfer of property accountability at a station is made, the accountable officer prepares a list of balances in triplicate as shown by the stock record accounts. The officer relieved of accountability and the officer assuming the accountability both sign a certificate as to the truth and correctness of the statement of balances on which the property accountability is transferred. This certificate must be approved by the commanding officer. If the condition of the accounts of an officer under orders for change of station is such that a complete transfer of his accountability cannot be accomplished in time to permit him to comply with his order, the commanding officer may retain the officer at the station and report his action and recommendation to the corps area commander.

Transfer of Property on Memo. Receipt in Possession of Troops Changing Station. A settlement is made with the supply officers for such supplies as are not to be taken with the troops at any station. For such supplies as must accompany the troops, other than articles of equipment "A" and "B", company or detachment commanders give memorandum receipts to the accountable officer who transfers the accountability to the accountable officer at the new station, attaching to the shipping ticket a signed copy of the memorandum receipt.

Transfer of Property in Possession of Enlisted Men Changing Station. A separate column on the individual clothing record (W.D. AGO Form 32) to the right of the columns which show the issues and credits (turned in) since date of enlistment is headed *"Taken"*, in which are entered the date of the soldier's departure and a complete list of the articles of clothing which he takes with him. The enlisted man and officer initial the new column and the form is sent with the service record to the new organization commander. The enlisted man is also required to sign a memorandum receipt for all other articles which he takes with him (except clothing charged on his money allowance). The company or detachment commander presents this receipt to the accountable officer who credits the company therefor and transfers the property on shipping tickets to the property officer at the new station.

Lost, Damaged and Unserviceable Property. Officers and other persons responsible for public property are charged for any loss or destruction of or damage to such property unless they are relieved from responsibility therefor through an approved report of survey. Stoppages against enlisted men directed after due procedure are entered on the payroll, the enlisted man signing the payroll being informed at the time that his signature will be regarded as an acknowledgment of the justice of the charge. He should also be advised of his right to demand a survey. Property carried away by a deserter, or lost through such desertion is entered against him on the next payroll as determined by survey. Civilian employees may be held for the loss of property due to neglect or embezzlement. An officer being held pecuniarily responsible is required to make settlement with the finance officer.

Shortage or Damage in Shipment. A notation is made on the bill of lading given the carrier, and an Over, Short and Damaged (O.S. & D.) Report, Form W.D., QMC 65, is prepared in triplicate by the receiving officer.

When carrier accepts responsibility, a written acknowledgement of the carrier's liability is obtained from the local agent and attached to the O.S. & D. Report which is disposed of as follows: One copy is filed with the corresponding shipping ticket, two copies and the of lading given the carrier, and an Over, Short and Damaged (O.S. Army, Washington, D. C., (Transportation Branch, Accounts Division).

When the carrier does not accept responsibility or when it is evident that the carrier is not at fault, the O.S. & D. Report is disposed of as follows: One copy is filed with the corresponding shipping ticket awaiting action, and two copies are forwarded to the shipping officer.

The shipping officer investigates the circumstances to determine any possible discrepancies between the quantity shown on the shipping ticket and the quantity actually shipped.

When the shipping officer accepts responsibility, he approves the O.S. & D. Report, signing both copies thereof received by him, returning one copy to the receiving officer and retaining the other copy, attaching it to the shipping ticket filed as a temporary voucher, after making the necessary correction on his stock record account. The receiving officer attaches the approved copy returned to him to the corresponding shipping tickets in his files, destroys the copy filed awaiting action, and notifies the consignee (carrier.)

When shipping officer does not accept responsibility he writes the word "Disapproved" over his signature on both copies of the O.S. & D. Report. Before doing so, the shipping officer should assure himself that the articles listed as short in the shipment are not in fact at his station because at a future date he will not be allowed to adjust his liability by merely taking up the articles on his property records. The shipping officer then returns one copy to the receiving officer attaching such affidavits in triplicate as he may desire to present for consideration of the survey officer. He retains the other copy for his files.

When a disapproved O.S. & D. Report is received back by the officer who originated it, he initiates a survey. When the property covered by the O.S. & D. Report is of a value less than $10.00, and more than $3.00, he may in lieu of initiating a survey, substitute the disapproved copy for the copy filed awaiting action, executing a certificate that the property was lost or damaged in transit, attaching to this copy of the O.S. & D. Report the affidavits furnished by the shipping officer and forward these papers to the Finance officer, U. S. Army, Washington, D. C.

If the shortage does not exceed $3.00, the receiving officer accomplishes the receipt on the shipping ticket in the usual way and returns it to the shipping officer, and in lieu of an O.S. & D. Report he executes a certificate on both the copy of shipping ticket returned and on the copy retained to the effect that the articles marked were not received and enumerates the value and states that they have not been taken up on the stock record account.

Unserviceable and Obsolete Property. Such property is classified with reference to disposition as:

Class 1—Property worn out or rendered unserviceable by fair wear and tear in the service, and property declared obsolete by the chief of the branch to which it pertains when there is no individual responsibility.

Class 2—Property rendered unserviceable from causes other than fair wear and tear in the service, and property declared obsolete by the chief of branch concerned when there is individual responsibility.

Class 1 is disposed of as follows:

It may be submitted directly to an inspector without prior survey or it may be submitted to a survey officer and if the invoice price does not exceed $500.00, the survey is considered complete for file as a property voucher upon approval of the appointing authority.

Except in the case of animals, Class 2 is submitted to a survey officer and disposed of as in Class 1.

Expensive Property of Certain Branches. When expensive articles of medical property, such as surgical instruments, laboratory apparatus, X-ray machines and other hospital equipment, have become unserviceable through fair wear and tear or from other causes, they must be surveyed and the survey report, after action thereon by the appointing and reviewing authorities, forwarded to The Surgeon General, who, upon approval, transmits all copies to the Chief of Finance for the action of the Secretary of War.

A survey is therefore required when public property is lost, destroyed or damaged other than by fair wear and tear in the service in order to determine the responsibility therefor, and the disposition of the property damaged.

A survey is not required, however, when the shipping officer or the carrier accepts responsibility on an O.S. & D. Report or when the value of the property lost, destroyed or damaged in transit does not exceed $10.00 and the circumstances warrant; when the value of the property ordered to be abandoned is not over $10.00, and in certain other cases, such as public animals dying of sickness or wounds.

Procedure of Survey of Property. Three copies of Report of Survey, separate for the different supply branches, are prepared on W.D., A.G.O. Form 15, with copies of all pertinent papers, such as O.S. & D. Reports, bills of lading, certificates and affidavits. Surveys should be initiated within 30 days after discovery of the loss, destruction or damage. Survey officers are appointed by the commanding officer from the field officers of the command whenever practicable, but may be appointed by higher authority.

Duties of Surveying Officer. The surveying officer fully investigates all matters submitted to him, calling for and scrutinizing all obtainable evidence, carefully examining each article of property listed in the survey, ascertaining and reporting facts, and submits an opinion and makes recommendation as to questions of reponsibility, and the disposition of property found unserviceable. He may recommend that infected clothing, deteriorated stores and certain medical supplies, determined by The Surgeon General as unsafe for use, be destroyed. The surveying officer usually recommends that all unserviceable property be salvaged. Such property will be turned in to the salvage officer upon a survey report approved by the commanding officer, or in case the property is valued over $500.00, higher authority.

The commanding officer is required to inspect personally each article of damaged property on survey report. If the invoice price exceeds $500.00 the approval of the next higher administrative commander is required.

Disposition and Use of Reports of Survey. When approved by appointing or other authority required, they are considered valid for file as property vouchers and are finally conclusive when accepted by the Secretary of War. One copy is delivered to the accountable officer and two forwarded to the corps area commander.

Inspection of Property for Condemnation. This duty is performed by inspectors-general, or officers designated usually by corps area headquarters. Property for presentation to inspectors is listed on inventory and inspection report, W.D. IGD, Form 1 in triplicate, separate for the different supply branches, for presentation to the inspector at the time of his visit. At the inspection the property is arranged in order of enumeration on the inventory, and the responsible officer accompanies the inspector. The inspector may recommend that the property inspected:

Be continued in service.
Be salvaged and dropped from accountability.
Be destroyed.
Be turned into depot.

Public animals which are condemned, (W.D. IGD Form 2 and 2a, one for each animal) are branded IC on the left side of the neck, under the mane. Such animals may be destroyed to terminate suffering, prevent contagion, or on account of old age. The destruction of property so ordered must be witnessed by a disinterested officer.

Salvage of Property. Unserviceable property having a salable value, both expendable and non-expendable, is turned over for salvage and disposition. Non-expendable property turned in for salvage must be accompanied by a statement of charges or a copy of approved report of survey, or inventory and inspection report, authorizing such disposal. Property so salvaged may be used by other agencies in the military service, repaired, sold, turned into depot or destroyed, depending upon condition.

Private Property Lost, etc. in the Military Service. Claims for the loss, damage or destruction of personal property which was appropriate to the needs of an individual in the military service may be made under certain conditions, such as the shipment on an un-seaworthy vessel, when the loss, etc., resulted while the owner was giving his attention to saving life or property belonging to the United States, or the loss was occasioned through accident in transportation by a common carrier or other agency of the United States Government, or capture by the enemy. Such claims should be presented to the commanding officer who convenes a board of 3 disinterested officers who take action in compliance with A.R. 35–7100. Claims may likewise be forwarded for reimbursement for payments from private funds for services or supplies obtained upon proper authority when it was impracticable to so obtain them through the usual procedure. See A.R. 35–7120.

Notes on Medical Field Equipment. The only medical items issued in common *to all organizations,* and kept and used in non-medical hands, are first-aid packets, foot powder, adhesive plaster, and canvas litters.

A first-aid packet (Fig. 95) for wounds and injuries, is carried on the person of each individual. (It is described in Chapter XIV).

Foot powder, for sore-feet, is issued on the basis of 2 boxes or cans per dismounted squad; also to mounted units when required.

Adhesive plaster (zinc oxide), also for sore-feet and abrasions elsewhere, is issued at the rate of 1 spool per squad; also to each dismounted combatant officer and warrant officer.

Canvas litters, (Fig. 116) 1 for each company or similar organization, are supplied in order that there may be immediately available in emergencies the means whereby his comrades may quickly transport a sick or injured man to an aid station, (Fig. 13) dispensary, or hospital for proper treatment.

Individual Equipment. When not on duty with a *hospital unit* all officers of the Medical Department below the grade of lieutenant colonel (excepting officers of the Medical Administrative Corps and Sanitary Corps), and all enlisted men of the Medical Department carry on their person when in the field, for the purpose of rendering first aid or other emergency treatment, certain technical Medical Department equipment known as a "kit."

For **medical service** they are as follows: Officer's medical kit, officer's dental kit, noncommissioned officer's medical kit, private's medical kit, and private's dental kit. These are now being issued in both old pattern and new pattern types. In the interests of economy the former will be used until the supply on hand is exhausted.

The old pattern kits are the medical officer's web belt, the dental officer's metal case, the Hospital Corps web belt, and the dental technician's metal case.

It is hoped to have all the personnel of the Medical Department supplied with the new pattern kits as soon as possible.

In developing this new individual equipment the aim was to obtain a standard container which could be used by all personnel of the Medical Department, rather than to continue, even though improved, the wide variety of containers, seven in all, previously utilized. The basic container adopted is a canvas pouch 2½ inches thick, 8¼ inches long, and 6 inches deep ("normal position"); capable of carrying ten first-aid dressings. By unfastening the laces at the bottom of the pouch, its depth can be increased to 12 inches ("emergency postion"); thus when necessary doubling its capacity (Fig. 171).

When two pouches are carried they are attached to a suspender-like device of heavy duck which fits snugly over the shoulders and closely to the back of the neck. (The Infantry pack, also used by medical soldiers, is put on *over* these suspenders.) With each pouch there also is supplied a cantle ring strap, which may be used as a hand strap in carrying the pouch as a satchel, or to attach it to the cantle ring of a saddle. There are also loose litter straps which, when attached to the suspender, provide excellent litter slings. One litter strap may be used individually to carry a single pouch, by slinging the strap over either shoulder and suspending the pouch from it, after the manner of the "musette bag." To adapt the contents of each pouch to individual requirements an insert is furnished. This insert is a stiff canvas piece with loops on if for carrying bottles, vials, instruments etc. It is fastened to the inside of the pouch.

An *officer's medical kit, new* pattern, consists of: 1 pouch, 1 litter strap, 1 cantle ring strap, 1 insert, 1 instrument case, 1 hypodermic syringe and needle sterilizer for same, 1 Robinson tourniquet, 6 hard rubber vials for medicinal tablets, emergency medical tags, and a small supply of bandages, iodine swabs, safety pins and adhesive plaster.

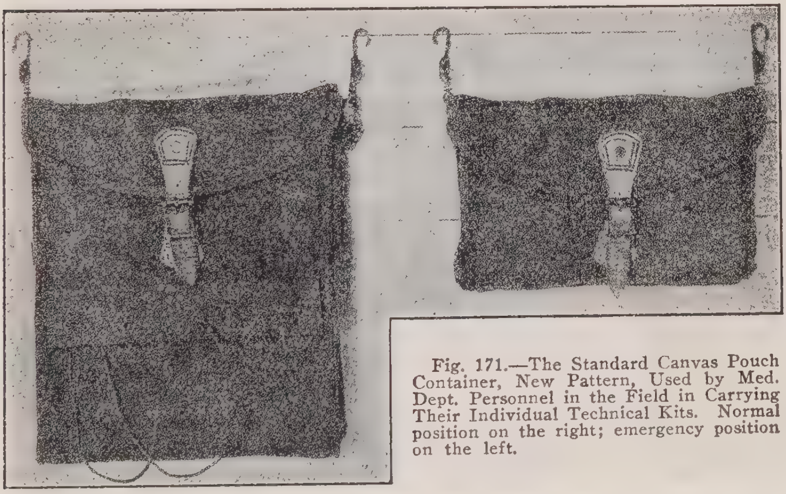


Fig. 171.—The Standard Canvas Pouch Container, New Pattern, Used by Med. Dept. Personnel in the Field in Carrying Their Individual Technical Kits. Normal position on the right; emergency position on the left.

An *officer's dental kit, new* pattern consists of: 1 pouch, 1 litter strap, 1 cantle ring strap, 1 insert, 1 hypodermic syringe and needle sterilizer for same, and a miscellaneous assortment of tooth-extracting forceps and smaller instruments for relieving emergency dental conditions.

A *noncommissioned officer's medical kit, new* pattern, consists of: 2 pouches, 2 cantle ring straps, and 1 suspenders. In the right hand pouch are a small case of instruments, iodine swabs, pins, adhesive plaster, hypodermic syringe, emergency medical tags, clinical thermometer, and an insert with 6 hard rubber vials for tablets. In the left hand pouch are gauze bandages, absorbent cotton, and plain sterilized gauze.

A *private's medical kit, new* pattern, (See Frontispiece), consists of: 2 pouches, 2 cantle ring straps, and 1 suspenders. In the right hand pouch are an insert, a case of instruments, gauze bandages, triangular bandages, flask for aromatic spirit of ammonia, iodine swabs, safety pins, adhesive plaster, and bandage scissors. In the left hand pouch are first-aid dressings, litter straps, lead pencil, and emergency medical tags.

A *private's dental kit, new* pattern, consists of: 2 pouches, 2 cantle ring straps, and 1 suspenders. In the right hand pouch are lead pencil, litter straps, first-aid dressings, emergency medical tags, hypodermic syringe, pins, bandages, and a small supply of miscellaneous dental preparations for emergencies. In the left hand pouch are an insert, gauze bandages, triangular bandages, small case of instruments, flask for aromatic spirit of ammonia, iodine swabs, safety pins, adhesive plaster, and bandage scissors.

Organization Equipment. As has been mentioned in a previous Chapter, all the equipment to which an organization is entitled is listed in what is known as a *Unit Equipment Table.* After the allowances for a unit are determined there still remains the problem of deciding how best to pack and transport the equipment. For the proper protection of its thousands of items used in the field, many of which are fragile or easily damaged, the Medical Department has adopted special types of containers; notably a standard chest for use by units serving at the front.

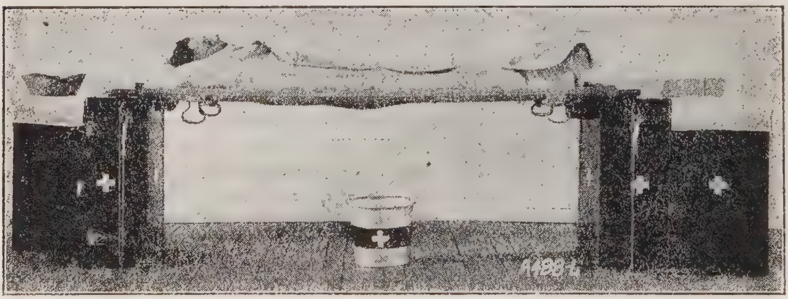


Fig. 172.—M. D. Field Chests Used as Litter Support in Improvising Operating or Dressing Table. Note method of opening chests, thus affording ready access to contents in wardrobe compartments and providing attachment for table top, carried in chest.

This standard chest is a modified trunk-locker with dimensions of approximately 31″ x 19″ x 15″. The chest is constructed of three-ply veneer, cemented to an outside sheet of galvanized steel. The chest is not only a container; it serves many other useful purposes. Two of these chests standing on end, with their lids opened out, can readily be used to support a litter; (Fig. 172) thus eliminating the necessity for supplying portable operating tables. To hold the litter in place a light steel bracket, carried inside the chest, is provided. Some of the chests are made up on the wardrobe-trunk principle; with their interiors adapted to the special type of equipment they carry. In others an ingenious set of trays, table tops, etc., may be made up from these interior combinations and take the place of equipment which, in the absence of these devices, would have to be included (Fig. 172, 173.)

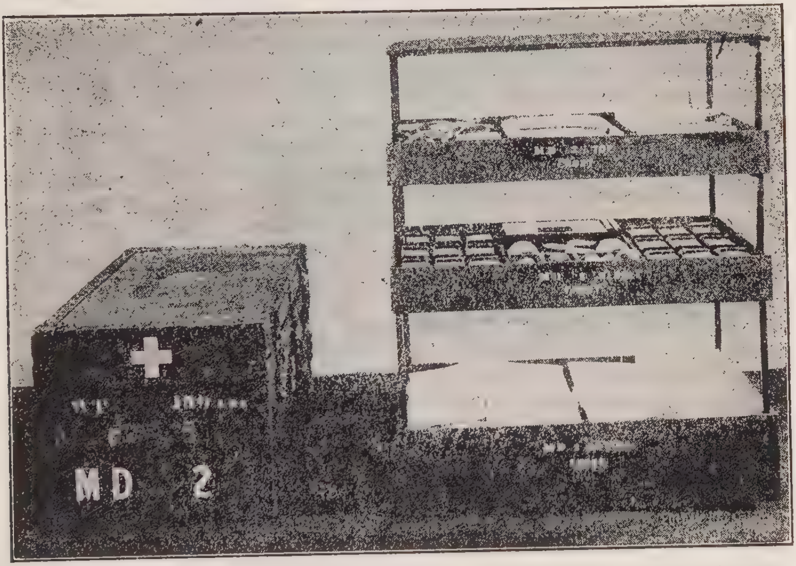


Fig. 173.– Field Chest M. D. 2, New pattern, Showing how its Trays and Contents are Arranged for Use. Table at top. In packing, the iron extension supports fold inside tray. Entire tray unit can be lifted from place to place by simply grasping table at top.

The shell of these chests is freely used as containers in assembling the organization equipment for medical detachments, all components of the medical regiment and medical squadron, and surgical hospitals, evacuation hospitals, etc.

As a peacetime measure, we store in our depots, as a *"war reserve"* an appreciable number of complete equipments for units of the type just mentioned. Such equipment is known as a *"unit assemblage."* The official War Department definition of a "unit assemblage" is as follows:

"A unit assemblage is the authorized equipment of a mobile organization, *stored or issued as a unit* under special instructions from the Secretary of War, such as an evacuation hospital. When the chief of a supply branch has been specifically authorized by the

Secretary of War to store a unit assemblage he requisitions on the chiefs of other supply branches for the components required to complete the assemblage normally stored and issued by them, as indicated in tables of basic allowances."

Under the above definition The Surgeon General, through the General Staff, is authorized by the Secretary of War to maintain in stock in certain selected depots the unit equipment for a specified number of medical detachments, evacuation hospitals, etc.

This assures The Surgeon General that he will be able to supply promptly all units called to active duty during the early phases of mobilization, without having to wait for further industrial production. All of these unit assemblages contain supplies properly chargeable to other departments, particularly the Quartermaster Corps, for procurement. In making up unit assemblages at his various depots The Surgeon General requisitions on the chiefs of other branches for the articles of their service needed to complete the assemblage.

Accordingly, if one walks into a medical supply depot and has pointed out to him a complete unit assemblage for an evacuation hospital, inspection will reveal that along with all the medical articles in the stacks is the full authorized allowance of tentage, axes, shovels, cooking appliances, etc., supplied by the Quartermaster Corps. Furthermore, if you are advised that one evacuation hospital complete is being shipped to you, it means that *all* items of equipment which you will need and to which your unit is entitled have been included in the shipment.

The Equipment of Medical Detachments. Because of the relatively large number of medical detachments employed in the field it is desired to devote some space to a description of the equipment authorized for those units. All medical detachments in the field are equipped with complete unit assemblages known as *"Field medical outfits"* and *"Field dental outfits."* This organization equipment was formerly called "Dispensary equipment." Field medical outfits come in two sizes—No. 1 being somewhat smaller than the No. 2. As in the case of individual kits, these outfits are being issued in old and new pattern assemblies, until the supply of the former now on hand has been exhausted. The No. 1 new pattern Field Medical Outfit corresponds to the old pattern outfit known as the "Regimental Dispensary Equipment"; the No. 2 new pattern F.M.O. to the old pattern outfit known as "Battalion Dispensary Equipment."

The Field Dental Outfit was formerly known as "Dispensary Dental Equipment." It also is being issued in two patterns, old and new, because there is still a considerable stock of the former on hand.

The following exhibits the general composition and basis of issue for these outfits.

Organization Equipment for a Medical Detachment:

Below is listed a unit assemblage issued complete by the Medical Department to Medical Detachments attached to and serving with other branches.	Allowances: *a.* War Set. *b.* Additional allowances as indicated.
Outfit, Dental, Field: *New pattern.* 1 Chest, M.D. #60, 95025, 157 lbs.; 5 cu. ft. or *Old pattern* (Dental dispensary equipment), weight 209 lbs. 1 Chest, Dental A, 95022, 43 lbs.; 1.2 cu. ft. 1 Chest, Dental B, 95023, 95 lbs.; 2.6 cu. ft. 1 Chest, Dental C, 95024, 71 lbs.; 4.9 cu. ft.	*a.* 1 per regiment or other unit having one or more dental officers attached per table of organization. *b.* Such number as may be necessary in a permanent or semi-permanent camp, but not to exceed 1 per dental officer.
Outfit, Medical, Field, No. 1: *New pattern.* Weight 1245 lbs. Pkg. #1, 1 Chest, M.D. #1, 99280, 121 lbs.; 5 cu. ft. Pkg. #2, 1 Chest, M.D. #2, 99281, 165 lbs.; 5 cu. ft. Pkg. #3, 1 Chest, M.D. #3, 99282, 161 lbs.; 5 cu. ft. Pkg. #4, 1 Chest, M.D. #4, 99283, 147 lbs.; 5 cu. ft. Pkg. #5, 1 Water Sterilizing Set, 99810, 17 lbs.; 1.1 cu. ft. Pkg. #6, 1 Lantern Set, 99547, 30 lbs.; 2 cu. ft. Pkg. #7, 1 Splint Set, 93650, 50 lbs.; 1.6 cu. ft. Pkg. #8, 1 Tent, pyramidal, (less poles and pins); 107 lbs.; 4.2 cu. ft. Pkg. #9, 1 Bag, tent pin, 99235, 37 lbs.; 1.6 cu. ft. containing: 28 Tent pins, large, for pyramidal tent; 28 Tent pins, small, for pyramidal tent. Pkg. #10, 1 Blanket Set, small; 99098, 69 lbs.; 5.5 cu. ft.	*a.* 1 per regimental headquarters except Engineer Combat Regiment; 1 per headquarters, Special Troops, Cavalry Division; 1 per battalion having an authorized war strength of less than 600 officers and men, except Engineer Combat Regiment; 1 per other type of unit (except regiment as a whole) having an authorized war strength of less than 600 officers and men, and one or more medical officers attached per table of organization.

MISCELLANEOUS
(341 lbs.; 15 cu. ft.)

Left loose to facilitate handling, loading, etc.

1 Axe, with helve.
6 Splints, litter bar for
3 Buckets, g.i., nested.
1 Marker, Red Cross, with staff.
6 Litters, canvas.
1 Pickaxe, with helve.

1 Shovel, short handle, r.p.
1 Tent pole for pyramidal tent (jointed)
or
Old pattern (Regimental Dispensary Equipment) Weight 1145 lbs.
Pkg. #1, 1 Chest, Medical & Surgical, 99270, 100 lbs.; 3.5 cu. ft.
" #2, 1 " Medical & Surgical, supplementary, 99275, 95 lbs.; 3.5 cu. ft.
" #3, 1 " Sterilizer, 99320, 82 lbs.; 3.5 cu. ft.
" #4, 1 " Medical A, 99287, 80 lbs.; 3.5 cu. ft.
" #5, 1 " Medical B, 99288, 58 lbs.; 3.5 cu. ft.
" #6, 1 " Medical C, 99289, 53 lbs.; 3.5 cu. ft.
" #7, 1 " Medical D, 99290, 85 lbs.; 3.5 cu. ft.
" #8, 1 " Medical E, 99291, 70 lbs.; 3.5 cu. ft.
" #9, 1 Splint Set, 93650, 50 lbs.; 1.6 cu. ft.
" #10, 1 Tent, pyramidal (complete, with poles and pins); 168 lbs.; 6.2 cu. ft.
" #11, 1 Desk, field, company, 35 lbs.; 1.1 cu. ft.
or
1 Desk, field No. 2, Medical Department, 99422.
" #12, 1 Blanket Set, small; 99098, 69 lbs.; 5.5 cu. ft.

MISCELLANEOUS
(200 lbs.; 10 cu. ft.)

Left loose to facilitate handling, loading, etc.
1 Axe, with helve.
3 Splints, litter bar for
3 Buckets, g. i., nested.
1 Marker, Red Cross, with staff.
3 Lanterns, oil, 2 with clear globes and 1 green.
6 Litters, canvas.
1 Pickaxe, with helve.
1 Shovel, short handle r. p.

Outfit, Medical, Field, No. 2.
New pattern. Weight 1414 lbs.
Pkg. #1–9, incl. Same as Field Medical Outfit No. 1, New pattern.
Pkg. #10, 1 Blanket Set, large, 99097, 117 lbs.; 11 cu. ft.
Pkg. #11, 1 Chest, M.D. #1, 99280, 121 lbs.; 5 cu. ft.

MISCELLANEOUS
(341 lbs.; 16 cu. ft.)

Left loose to facilitate handling, loading, etc.
1 Axe, with helve.
6 Splints, litter bar for
3 Buckets, g. i., nested.
1 Marker, Red Cross, with staff.

a. 1 per battalion having an authorized war strength of more than 600 officers and men; 1 per headquarters, Special Troops, except Cavalry Division; 1 per Engineer Combat Regiment; 1 per other unit (except regiment as a whole) having an authorized war strength of more than 600 officers and men and one or more medical officers attached per table of organization.

12 Litters, canvas.
1 Pickaxe, with helve.
1 Shovel, short handle r. p.
1 Tent pole for pyramidal tent (jointed).

or

Old pattern. (Battalion Dispensary Equipment) Weight 1334 lbs.
Pkg. #1–11, incl. Same as Field Medical Outfit No. 1, Old pattern.
" #12, 1 Blanket Set, large, 99097, 117 lbs.; 11 cu. ft.

MISCELLANEOUS

(341 lbs.; 16 cu. ft.)

Left loose to facilitate handling, loading, etc.

1 Axe, with helve.
6 Splints, litter bar for
3 Buckets, g. i., nested.
1 Marker, Red Cross, with staff.
12 Litters, canvas.
3 Lanterns, oil, 2 with clear globes and 1 green.
1 Pickaxe, with helve.
1 Shovel, short handle r. p.

In old pattern assemblages a special effort has been made to make them on the whole approximate the articles and quantities included in the new assemblages. Obviously, the method of packing in various kinds of old containers differs from the new.

As regards old containers, an index number is given (e. g. Chest, Dental A—#95022), and reference thereto in the *Medical Supply Table* will lead to the complete list of contents in such container.

As regards new pattern containers, their contents are similarly itemized in the Medical Supply Table. Roughly, the contents are as follows:

Chest, M.D. No. 1 (Fig. 172)—Bandages, cotton, gauze, rubber basins, rubber aprons, pins, bandage scissors, iodine swabs, etc.

Chest, M.D. No. 2. (Fig. 173)—Small operating case, ether, miscellaneous tools, tourniquets, thermometers, emergency medical tags, instrument trays, rubber gloves, instrument sterilizer, material for venereal prophylaxis, etc.

Chest, M.D. No. 3. (Fig. 170)—Small gas-burning stove, cooking utensils, liquid food supplies, cigarettes, hot water bags, soap, flashlights, miscellaneous tools, etc.

Chest, M.D. No. 4. (Fig. 175)—Writing table and stools, stationery cabinet, stationery, portable typewriter, blank forms, pamphlets of appropriate AR., TR., etc.

Water Sterilizing Set. (Fig. 70)—Water bag, metal trefoil, canvas buckets, calcium hypochlorite, etc.

Lantern Set. (Fig. 174)—Lanterns, globes, wicks, and a can of oil.

Splint Set. (Fig. 174)—The assortment of splints listed in Chapter XIV.

Chest, M.D. No. 60.——A dental chair, a dental engine, and all dental instruments and appliances necessary in operating an emergency dental clinic in the field.

For example, as above prescribed, the complete organization equipment authorized for the Medical Department personnel attached to an infantry regiment at war strength, *for medical service* (veterinary excluded) is: 1 Field Medical Outfit No. 1 (at regimental headquarters), 3 Field Medical Outfits No. 2 (1 with each battalion), 1 Field Dental Outfit (at regimental headquarters). These field outfits include every article to which a medical detachment is entitled in the way of organization equipment.

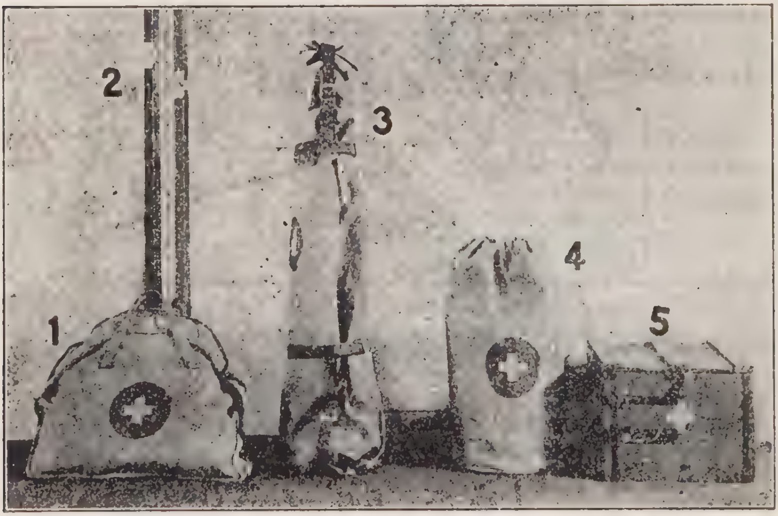


Fig. 174.—Some Components of a Field Medical Outfit: 1. Water Sterilizing Set; 2. Pole for Pyramidal Tent, cut in half, one section provided with metal cuff; 3. Splint Set; 4. Tent Pin Bag; 5. Lantern Case.

With the Regular Army in time of peace this equipment ordinarily is held in reserve at various station hospitals, under the exclusive control of The Surgeon, ready for use in meeting any local field service requirements which may arise. When in the field, these field outfits of the Medical Department remain with their unit under all circumstances. In the Combat Zone they are utilized in establishing aid stations, and outside the Combat Zone, dispensaries for the organizations to which attached.

A complete F.M.O., with in addition a Field Dental Outfit, can be carried on one vehicle. Current tables of organization authorize an escort wagon for the transportation of such cargo. As soon as it can be officially effected the escort wagon will be supplanted by the new type of animal-drawn ambulance. (Fig. 17.)

Old pattern animal-drawn ambulances, except in strictly motorized organizations where a motor ambulance or a truck may be substituted, may likewise be used for the transportation of such cargo. The method of assembling and packing these field outfits permits the ambulance to be utilized as a cargo vehicle, and yet leaves it available for the transportation of patients as needed; thus making one vehicle serve the same purpose for which two were heretofore authorized.

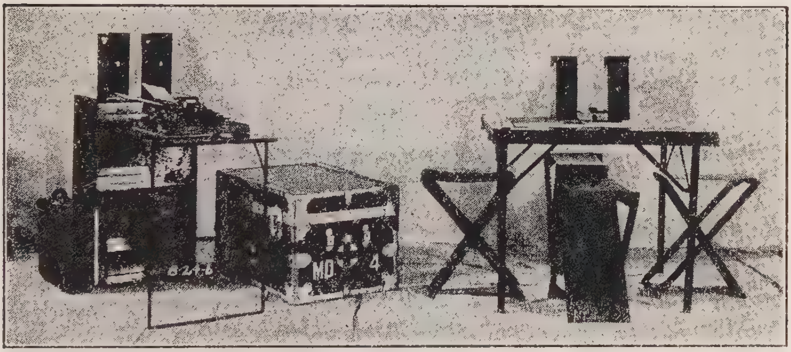


Fig. 175.—Field Chest M. D. 4. Our Field Office Set. A component of field medical outfits. All articles shown fold or nest and are carried in the one chest appearing in this illustration.

When cavalry or any other mounted organization is required to operate over terrain not negotiable by an ambulance, improvised pack outfits, travois (Fig. 119) or sleds for the transportation of such selected material from these outfits as may be needed while separated from the vehicle, must be supplied by the local commander concerned.

No field ranges or equivalent cooking facilities ordinarily are provided a medical detachment. Members of the detachment are habitually rationed and messed with the nearest company or companies of the organization with which they are serving as may be directed by the regimental or other commander concerned.

CHAPTER XXI

CLERICAL WORK

Introduction. Not all soldiers make good clerks. Those who have had previous experience in civil life, who can write legibly, or are familiar with the use of the typewriter and show aptitude for this kind of work in the military service receive training during the course of their daily assignment, or in classroom instruction conducted for them from time to time.

Clerical work in the military establishment roughly falls into two general classes: that dealing with correspondence in the form of letters, indorsements, orders, circulars, etc., and that dealing with certain reports, records and returns, for which blank forms are widely distributed.

Practically all blank forms used in rendering reports and returns and keeping the records of the Army contain instructions as to their preparation. Before proceeding with the preparation of any paper the new clerk should carefully read those instructions until he is thoroughly familiar with their requirements.

Constant study and practice are necessary on the part of all efficient clerks. In clerical work accuracy and neatness are two outstanding necessities. Always read over and check back on communications, reports, etc., prepared for the signature of another, with the same feeling of responsibility that one would exercise in preparing a paper for his own signature. In this age of the typewriter, typographical errors particularly should be sought for and corrected. Carbon copies should be clear and free of smears. When employing pen and ink use a blotter freely as an aid in turning out neat work. For those engaged in clerical work permanently, particularly in the general correspondence section of offices, a knowledge of stenography is a great asset and its study should be encouraged.

No matter how conscientious and thorough a clerk may be in turning out his work, there is one grave fault that can impair his usefulness and against which he must be constantly on guard. We refer to the "leakage" of official information to which he has access. All clerks must remember that they occupy a position of trust and responsibility. Because they usually see, if not actually have a hand in filing or preparing, all incoming and outgoing communications, they know "what is going on" in an organization. All such information coming to their notice should be treated as strictly confidential and not discussed with anyone outside the office in which they work. When "inside" or "advance" information on any subject is sought by a member of a unit invariably turn a deaf ear to such inquiries. At times a unit commander in his official capacity must make reports or recommendations, the contents of which he particularly does not care to have divulged until official action thereon has been taken and the information is released in the proper manner. Again, a commander is sometimes forced to take official action which to him personally may be distasteful. If the commander wants to impart advance information to any individual or organization concerned as to action being taken by him, that alone is his prerogative. A trustworthy clerk is one in whom silence is golden; he must always exercise the greatest care to prevent "leaks" or idle or thoughtless remarks on his part from embarrassing his chief.

Military Correspondence. When we speak of a "communication" we are thinking in terms of official letters, memorandums, reports, indorsements, telegrams, cablegrams, and radiograms.

Correspondence Limited. Written correspondence should be resorted to only when necessary owing to the physical separation of the parties concerned, or in the exceptional case in which the nature of the business requires a written record. Personal or local telephonic conference should be the rule, record being made by those concerned when necessary.

Unnecessary Reports. When desired information may be obtained from records contained in files which are available to the person desiring the information, neither subordinates nor others should be called upon to furnish it from any other source.

Signature by Subordinate. Except as otherwise prescribed by the Secretary of War, a commander, or chief of a branch, or other official may require a suitable officer subordinate to himself to sign certain communications for him. When he does so, however, he is as fully responsible for a communication so signed as though he himself had signed it.

Courtesy in Correspondence. In official correspondence between officers of the Army or between officers of the Army and officials of other branches of the public service, and especially in matters involving questions of jurisdiction, conflict of authority, or dispute, such correspondence always should be courteous in tone and free from any expression partaking of a personal nature or that might give offense.

Contents not Revealed. The contents of official communications must not be revealed except to those officially entitled to receive them, or in cases specially ordered by competent authority.

Prompt Reply. Reply thereto must, when practicable, be made within 24 hours after receipt of a communication requiring reply, and in any event as soon after such receipt as circumstances permit.

When for any sufficient reason it is impossible to make full and prompt reply to a communication received and requiring reply, acknowledgment of receipt of the communication should be made at once, with a statement giving the cause of the anticipated delay, and giving the date on which reply will probably be forwarded.

Record Keeping and Business Methods. No record is kept in any office at a military headquarters respecting any communication properly pertaining to the business of any other office of the same headquarters in which an established correspondence record or file is authorized, but record of the communication is kept, if at all, only in the office in which such record of file is authorized.

Official communications received in any office are opened promptly and each are at once stamped with the name of the office and date of receipt. The received stamp is placed immediately below the body of the communication, or of the indorsement, as the case may be.

Channels of Communication. The general rule is that communications whether from a subordinate to a superior, or vice versa, must pass through intermediate commanders. This rule is not interpreted as including matters in relation to which intermediate commanders can have no knowledge and over which they are not expected to exercise control. The Surgeon General and other chiefs of War Department branches and bureaus are intermediate commanders between higher authority and the personnel of their respective branches or bureaus, who are serving under the exclusive control of themselves and their subordinates.

Through Post, Camp, and Station Commanders. All official communications to or from persons serving at a military post, camp, or station, relating to affairs of such post, camp, or station, including all communications relating to unit commanders reporting directly to the post, camp, or station commander, pass through the commander thereof.

To War Department, from Army. All official communications from the Army intended for consideration in the War Department are addressed to The Adjutant General, unless they pertain solely to the business of a branch or bureau, in which event they are sent direct to the chief thereof.

After call or draft into Federal service, all official communications from the National Guard intended for consideration in the War Department are addressed to The Adjutant General.

To Army, from War Department. Correspondence of the War Department with the Army, including correspondence pertaining to the business of a branch or bureau, is made through or by The Adjutant General.

Militia Bureau; the National Guard. The Militia Bureau is the proper channel of communication between the War Department and the National Guard while the latter remains in State service.

Communications emanating from the Militia Bureau and addressed to the governors of States or Territories are prepared for the signature of the Secretary of War. Those addressed to adjutant generals of

States, Territories, or the District of Columbia are signed by the Chief of the Militia Bureau or by officers assigned as his assistants and authorized by him to authenticate official communications.

The Chief of the Militia Bureau communicates directly with the heads of branches and bureaus and with corps area and department commanders, and vice versa, in reference to all matters pertaining exclusively to the National Guard.

Reference Forms. In military correspondence we invariably quote references. These are made in a certain standardized manner.

References to Army Regulations. Reference to the Army Regulations ordinarily is as shown in the following example: "Reference paragraph 1, AR 350–2505." (Note that periods do not follow A and R).

References to General Orders, Bulletins, Circulars, Etc.

Examples:

"Reference paragraph 2, Section II, General Orders, No. 82, War Department, 1919 (System of military publications)."

"Reference Section I, Bulletin No. 1, War Department, 1920."

"Reference Circular No. 4, War Department, 1924."

References to Letters or Indorsements.

Examples:

In referring to a letter:

"Reference 210.2, Off. Div., AGO Feb. 1, 1924, Subject '———,' to this office."

"Reference 320.2, Q. M. Fort Jay, N. Y., Feb. 1, 1924, Subject '———,' to the C. O., Co. G, 17th Inf."

In referring to an indorsement:

"Reference 4th Ind., 220.2, Enl. Div., AGO Feb. 1, 1924, to the C. O., Fourth Corps Area, on same file AGO Jan. 15, 1924, Subject '———.'"

"Reference 6th Ind., 123.7, Hq. 17th Inf., Feb. 1, 1924, to The Surgeon General, on 123.2, Hq. Second Corps Area, Jan. 15, 1924, Subject '———.'"

References to Telegrams.

Examples:

"Reference telegram these Hq., Feb. 1, 1924, to The Adjutant General recommending ———."

"Reference your telegram Feb. 1, directing ———."

References to Cablegrams and Radiograms.

Examples:

"Reference paragraph six, our cable eight hundred eight."

"Reference paragraph six, your radio eight hundred eight."

Abbreviations and Modifications. The prescribed forms for reference may be abbreviated or otherwise modified, but in any case the reference must contain everything necessary to enable a prompt and certain identification of the matter referred to.

Preparation of a Communication. An official communication other than a cablegram or radiogram must refer to *one* subject only.

Letters of transmittal and wrapper indorsements are used only when necessary, and when used refer only to the matter transmitted; none are required with returns, estimates, requisitions, periodical reports, or similar papers.

A wrapper indorsement is used only when it will serve the purpose better than a letter of transmittal.

When two or more separate communications require separate action, the required action is placed on *each* and they are continued as separate communications, rather than assembled and transmitted under a letter of transmittal or wrapper indorsement.

Retention of Original Communication. In a proper case, when a communication is of such character that the original, rather than a carbon copy or other record thereof, should be retained for record or other purposes in any office in which, or by any person by whom, it is received, the original may be so retained and a new communication used for conveying such action as is required. In any such case, the new communication contains such reference to the previous communication as is necessary for a proper identification.

Letter-size Paper. For all letters, for indorsements generally, and for all reports with reference to individuals, except reports made on printed blank forms prescribed by the Secretary of War, the paper used is 8 by 10½ inches.

When more than one sheet is used for a communication, including the indorsements thereon, all must be of the same size.

Unused Margins. Unused margins of not less than the following widths are left in each communication:

At top: First page, 1 inch; Second and succeeding pages, 1¼ inches; At left, 1 inch; At right, ¾ inch; At bottom, 1 inch. Bottom margin contains page number.

Use of "Commanding General" and "Commanding Officer." When the command is normally that of a general officer, the expression "Commanding General," or its abbreviation, is used in addressing the commander thereof even though an officer of lower grade be temporarily exercising command, e. g., Commanding General, Second Corps Area.

When the command is normally that of an officer below the grade of brigadier general, the expression "Commanding Officer," or its abbreviation, is used, e. g., Commanding Officer, 17th Infantry.

Addressed to Commander. Official communications are addressed to the commander concerned and not to his adjutant general or other officer occupying a corresponding position.

Spacing. When typewritten, the body of a communication is ordinarily single spaced with a double space between numbered paragraphs.

Paragraph and Subparagraph Designations. The paragraphs of a communication are numbered consecutively in a single series, Arabic numerals being used, and the several paragraphs of each indorsement thereon are similarly numbered.

When designations are used for the divisions of a paragraph, the following system is followed:

The primary divisions are designated by *underscored* lower-case letters, as a, b, c, etc.

Subdivisions of the primary divisions are designated by Arabic numerals in parentheses, as (1), (2), (3), etc.

Subdivisions of subdivisions of the primary divisions of paragraphs are designated by *underscored* lower-case letters in parentheses, as (a), (b), (c), etc.

The following illustrates the foregoing rules, 1 being the assumed number of the paragraph:

1. a. ....
(1) ....
(a) ....
(b) ....
(2) ....
(3) ....
b. ....
c. ....
(1) ....
(2) ....

When the communication is printed, italic letters are used in lieu of, and as above prescribed for, underscored lower-case letters.

Page Numbering. The several pages of a communication, including the pages bearing indorsements, are numbered consecutively in a single series, midway, about one-half inch from the bottom.

The writer of the first matter on any page numbers that page. Each office which handles a communication sees that all pages thereof are numbered.

One Side of Sheet. Except in using prescribed forms containing provision for use of both sides of the sheet and except for matter which is mimeographed or otherwise reproduced, one side of a sheet only is used in all communications and inclosures.

Use of Rubber Stamps. Rubber stamps may be used in lieu of typing for all purposes for which, and in all cases in which, the use of such stamps appears to be practicable and advantageous.

Use of Colored Inks. Except as otherwise authorized or prescribed by the Secretary of War, black ink only is used in official communications.

How Arranged and Fastened. For other than filing purposes the several parts of a communication ordinarily are arranged and fastened together in the following order:

Original with pages in numerical sequence followed by original indorsements in numerical sequence, except that the last indorsement with pages in numerical sequence are on top.

Inclosures, if any, in numerical sequence.

Copy or copies, if any, of the basic communication followed by copy or copies, if any, of indorsements in numerical sequence.

For filing purposes the several parts of a communication ordinarily are similarly arranged and fastened together, except that the last original indorsement follows immediately the other original indorsements.

The character of fastening will be such as—

Reasonably to insure against casual separation of the parts.

To permit intentional separation without mutilation. Pins should not be used as fasteners.

Military Letters. In all official correspondence between offices and individuals in or under the War Department, and with offices and individuals in or under the Navy Department, we are governed by certain standard principles.

"Immediate Action" Letters. Letters that upon receipt require attention and prompt action are prepared on "Immediate Action" paper, are inclosed in "Immediate Action" envelopes, and are known as "Immediate Action" letters.

The principal purpose in providing for "Immediate Action" letters is to reduce to a minimum the great expense incident to telegraphic communication, and to prevent overloading the telegraph service and thus interfering with the transmission of urgent messages by that service.

"Immediate Action" letter paper and envelopes are *not* to be used for the purpose of expediting action on communications *which do not actually require immediate attention and prompt action upon receipt.*

"Immediate Action" Paper. The first sheet and the last sheet of the original of an "Immediate Action" letter, and of the original of each indorsement thereon, ordinarily have a Red border, and the words "Immediate Action," in bold-faced capital letters, at the top and bottom, spaces being left in the border for these words.

For intermediate sheets of the original, and for all sheets of the carbon or other copies of "Immediate Action" letters, ordinary blank letter paper is used, but the first and the last sheet of each copy of the letter and of each indorsement thereon is conspicuously stamped or otherwise marked, at both top and bottom, "Immediate Action."

Heading of Letter, General. For all letters to be signed by a subordinate for or by order of a chief of a branch or bureau, or for or by order of a commander, or other similar official, the letter heading used is that of the headquarters and office of such chief, commander, or other official, and it does not contain the title of any subordinate office, e. g., For all letters signed for or by order of The Surgeon General the letter heading used is that of the War Department, Office of the Surgeon General, and it does not contain the title of any subordinate office, such as that of an assistant, or a chief of service, or any other officer.

For all letters signed for or by order of a corps area or department commander, whether by the chief of staff, or an adjutant general or some other officer, the letter heading used is that of the headquarters and office of the corps area or department commander, and it does not contain the title of any subordinate office, such as that of the chief of staff, or the adjutant general or any other officer.

Heading of Letter, Contents, Arrangement. The upper third of the first sheet of each letter is except as to additional matter in "Immediate Action" paper, devoted solely to the following matter, none of which will be less than one inch from the top.

The heading of a letter from an office contains the following:

The designation of the headquarters.

The designation of the office.

At the upper left, a brief request for reference to the file number in making reply, including the file number and such additional identifying matter, if any, as may be desirable. If there be no file number or other identifying matter this space is left blank.

At the upper right, the identifying initials of the person dictating and of the person typing the letter, together with such additional identifying matter, if any, of similar character as may be desirable, including, when the letter is to be signed by another, the written initials of the person dictating the letter. When considered desirable these initials and other identifying matter, if any, may be placed elsewhere, or may be placed only on the record copy to be retained, or may be omitted.

Post-office address.

Date.

The word "Subject," followed by a brief statement, ordinarily in not to exceed ten words, of the subject matter of the communication.

The word "To," followed by the official designation or grade, name, organization, and branch of service of the person addressed, followed when necessary by the post-office address written underneath.

Examples:

HEADQUARTERS SECOND CORPS AREA, JWD-RWR
OFFICE OF THE CORPS AREA COMMANDER

In reply refer to: Governors Island, N. Y.,
004.6121 Feb. 1, 1924.

Subject: War Risk Insurance, Applications for.
To: The Adjutant General,
Washington, D. C.

COMPANY "G", SEVENTH INFANTRY, JWD-RWR
In reply refer to: Fort McPherson, Ga.
56 Feb. 1, 1924.
Subject: Loss of Company Funds.
To: C. O. 17th Inf.,
Fort McPherson, Ga.

The heading of the letter from an individual writing as such contains the following:

Post-office address.
Date.
"Subject" and "To".

Example: Fort McPherson, Ga.
Subject: Request Leave of Absence. Feb. 1, 1924.
To: C. O. Fort McPherson, Ga.

Printing. So much of the matter specified above as is practicable, including one folding mark at the left, may be printed, but when printed forms are not used the matter which would ordinarily be printed may be typed, stamped, written, or otherwise produced in the form prescribed, except that the embossing of letterheads and noteheads will not be permitted at Government expense.

Names of the officers or other persons, telephone numbers, or any other matter except such as described above must not be printed on letterheads for use in any branch of the military service without prior authority therefor in writing from the Secretary of War.

Body of Letter. The matter required above is followed by the body of the letter, beginning below the upper one-third of the sheet.

No Salutation; No Complimentary Close. Salutations such as "Sir," "I have the honor," "I would respectfully" and complimentary closings such as "Respectfully," "Very respectfully," etc., are not used.

"By Command or Order of———"; "For———." When a subordinate signs a communication for a chief of a branch or bureau, or a commander, or other similar official, and the authority by which the communication is made does not sufficiently appear in the body of the communication, the appropriate one of the following forms appears on the communication between the body thereof and the signature:

In communications to subordinates:

"By command of——— or by order of———," e.g.,
"By command of——— General———,"
"By order of The Surgeon General,"
"By order of Colonel———,"

In communications to other than subordinates:

"For the———," e.g.,
"For The Surgeon General,"
"For The Commanding General,"
"For The Regimental Commander,"
"For The Commanding Officer."

Signatures. The body of a communication or, when used, the "By command or order of———," or "For———," is followed by the signature, except that routine indorsements on communications passing between officers of the same headquarters may pass unsigned.

The signature ordinarily consists of the first name, middle initial, and last name.

The signature of an enlisted man always consists of his first name, middle initial, and last name, followed by his Army serial number, and must be identical with signature on his enlistment record for the enlistment in which he is serving at time of signing.

The signature, if any, on routine indorsements referring, transmitting, forwarding, and returning papers consists of the initials only.

Signature is made with pen or, when necessary in the field or otherwise, with indelible pencil, but never by facsimile. Signatures must be plainly and legibly written.

Name Signatures, Matter to Follow. Name signatures are followed by the matter specified below:

Except signatures to stamped indorsements, the typewritten, stamped, or printed name followed by the rank and organization, identical with the signature, e. g.,

"John W. Doe,
Captain, Medical Corps."

If the signature is that of the chief of branch or bureau, his official designation, e. g.,

"Major General,
The Surgeon General."

If the signature is that of a commanding officer signing as such, the word "Commanding" after his rank and organization, e.g.,

"Colonel, Medical Corps, Commanding."

If the signature is that of a staff officer signing correspondence of an office—

Of which he is the head, the title of such office, e. g.,

"Colonel, Medical Corps, Surgeon."
"Major, Finance Dept., Finance Officer."

In which he is on duty but not the head—

"Major, Medical Corps, Assistant."

If the signature is that of an individual signing in a special capacity not provided for above—

An indication of the special capacity in which he is signing, e. g.,

"Major, Medical Corps, Surveying officer."

"Colonel, General Staff, President, Board of officers."

If the signature is that of an individual as such—

His grade, organization, and branch.

Communications to Members of Congress and other notable civilians are signed by the senior officer present for duty in the War Department branch forwarding the communication and by the commander of a corps area, department, post, camp, or station at other places.

The grade, organization, and branch of the signer follow immediately the typed, stamped, or printed name, or in case of stamped indorsements, the signature, and precede any other required matter.

Copies, Number and Contents of. Each letter or indorsement that is typewritten and is addressed to an office or individual in or under the War or Navy Department is made with two carbon or other copies. Each stamped indorsement which is similarly addressed ordinarily is made with one copy. When necessary an additional copy or copies of either typewritten or stamped matter may be made. Copies ordinarily are not signed, but the signature placed on an original is typed, stamped, or otherwise produced on each copy thereof. Each copy made shows all matter on the original, including particularly such part of the printed letter heading, if any, as may be necessary for purposes of identification. Any person who makes changes on an original must make or cause to be made on all copies thereof such changes as will make them identical with the original.

Copies, Disposition of. The prescribed *copies* are disposed of as follows:

If the communication is sent by an office of record—

One is forwarded with the communication to the recipient who is finally to approve, disapprove, or take other principal action on the communication.

One, when a second copy is made, is retained for the records of the sending office.

If the communication is sent by an office not of record, or by an individual—

One is forwarded with the communication to the recipient who is finally to approve, disapprove, or take other principal action on the communication.

One, when a second copy is made, is forwarded with the communication to the first office of record receiving the communication.

One, when a third copy is made, is retained by the writer until no longer required by him, when it may be destroyed.

The first office of record which receives a communication from an office not of record or from an individual withdraws one copy thereof for its records. No other intermediate recipient of a communication withdraws a copy thereof.

When the original of a communication which has been finally approved, disapproved, or otherwise acted upon by the authority competent so to do, is sent out of the office in which so finally approved, disapproved, or otherwise acted upon, the complete copy thereof received with it, including the copy of each indorsement, is filed in such office.

When the original of a communication which has been finally approved, disapproved, or otherwise acted upon by the authority competent so to do, is about to be filed in the office in which so finally approved, disapproved, or otherwise acted upon and there is no substantial reason for anticipating that such original will again be put in correspondence, and there is no other substantial reason for retaining the copy thereof received with it, such copy, including the copy of each indorsement, is destroyed. If there is substantial reason for anticipating that the original will again be put in correspondence, or there is other substantial reason for retaining the copy, the latter, including the copy of each indorsement, is retained and filed with the original.

When the original of a communication which has been finally approved, disapproved, or otherwise acted upon by the authority competent so to do, is about to be filed in the office of origin or in the first office of record through which it was transmitted, and there is no substantial reason for anticipating that such original will again be put in correspondence, and there is no other substantial reason for retaining the copy thereof there on file, the latter, including the copy of each indorsement, may be destroyed.

Records for Intermediate Recipients. An intermediate recipient of a communication makes and retains such copy or other record thereof as is required. Such record shows, as briefly as practicable, only such facts as are requisite. In making a record of a communication bearing a file number of an office other than that in which the record is being made, such file number, together with office mark and date, is included.

Except in the office of origin or in the first office of record through which it is transmitted, and in the office which finally approves, disapproves, or takes other principal action thereon, no record, as a rule, is kept of a communication relating solely to an individual and not disciplinary in nature, unless the action taken is such that a record appears particularly to be desirable, or unless the office to which the communication is addressed does not finally approve, disapprove, or take other principal action thereon, in which case a record is made and kept by the office to which such communication is addressed.

Folding. Letter paper ordinarily is folded in three equal folds, parallel with the bottom, the lower fold over the face of the letter and the top fold toward the back of the letter.

When several communications are to be mailed at the same time by an office or individual to another office or individual at one address, they are so far as practicable, mailed together in one envelope. When the number or bulk is sufficient to warrant, they are mailed flat in an envelope of appropriate size, in which case the envelope bears conspicuously at both top and bottom the words "Letter Mail."

Indorsements. Officers who forward communications received by them and requiring action indorse thereon their *approval* or *disapproval*, with remarks. No communication is forwarded for action without some expression of opinion or recommendation, or both, including when appropriate the reasons upon which based.

The indorsements on a communication are numbered with Arabic numerals in a single series beginning with 1.

Indorsements may be stamped or written.

Stamped Indorsements, When Used. Stamped indorsements may be used in routine cases relating solely to individuals and not disciplinary in nature, and in all other cases in which use thereof is practicable and advantageous, particularly in cases in which no record is required or desired to be kept.

Stamped Indorsements, Where and How Placed. Stamped indorsements begin about one-half inch below the lowest element of the next preceding matter on the same page, and are placed in order of sequence, two in line parallel to the bottom of the page, the left edge of the indorsement at the left not more than one-half inch from the left edge of the page.

Examples of stamped indorsements:

2d Ind.
Hq 15th FA Camp Travis, Tex.
Mar. 1/23
To CG 2d Div.
——— Approved.
John Doe,
Col. 19th FA,
Commanding.

2d Ind.
Hq Fort McPherson, Ga.
Mar. 1/23.
To CO 17th Inf.
For compliance.
By order of the Post Commander,
John Doe,
Major, A.G.D.,
Adjutant General.

When a stamped indorsement is made, blank spaces therein may, so far as necessary, be filled in by use of other stamps, with pen or when necessary in the field or otherwise, with indelible pencil.

Written Indorsements, When Used. Written indorsements are used in all cases in which use of a stamped indorsement is neither prescribed nor practicable and advantageous, particularly in cases in which a record is required or desired to be kept.

Written Indorsements, Where and How Placed. The writing width of written indorsements is the same as that of the letter. The first written indorsement begins about ½ inch below the lowest element of the next preceding matter on the same page, and succeeding written indorsements follow one another serially, with a space of about ½ inch between indorsements, on the same page.

Written Indorsements, Contents, Arrangement. In preparing a written indorsement the items enumerated below are written in longhand or on the typewriter, in the sequence and in the general manner indicated in the examples below, authorized abbreviations or, in the absence thereof, other appropriate abbreviations being used so far as practicable.

File number, if any, of the communication, including necessary additional identifying matter.

Serial number of the indorsement.

Identifying initials of the person dictating and of the person typing the indorsement, together with such additional identifying matter, if any, of similar character as may be desirable, including, when the indorsement is to be signed by another, the written initials of the person dictating the indorsement. When considered desirable these initials and other identifying matter, if any, may be placed elsewhere, or may be placed only on the record copy to be retained, or may be omitted.

Official designation of the headquarters and the office, if any, by which the indorsement is being sent.

Name of the place from which the indorsement is being sent.

Date.

The word "To," followed by the official designation of the person to whom the indorsement is being sent, or if being sent to an individual, his grade, name, organization and branch.

Post-office address of the addressee, if necessary.

Examples:

AG 300.33 (1-12-24) Pub. Div. 1st Ind. JWD-RWR
War Department, AGO, Washington, Feb. 1, 1924—To CG Second Corps Area.

54 1st Ind. JWD-RWR
Co. G, 17th Inf Fort McPherson, Ga., Feb. 1, 1924—To 1st Lieut. John W. Doe, 17th Inf.

210.31 2d Ind. (From an individual.) JWD-RWR
Fort Snelling, Minn., Feb. 1, 1924—To CO 28th Inf.

The foregoing is followed by the body, if any, of the indorsement, beginning, when typewritten, two spaces below. Such expressions as "Referred," "Transmitted," "Forwarded," and "Returned" are not to be used nor are such expressions preceded by the word "Respectfully" used.

The concluding parts of, and signatures on, indorsements, and copies of indorsements, are the same as above described for "letters."

Inclosures.

Exhibits not Inclosures. Exhibits to reports of boards, etc., are marked as such and appended to the reports to which they respectively pertain, and are not made or noted or otherwise treated as inclosures thereto.

Accompanying Copy not an Inclosure. A *copy* of a communication which accompanies the original is not considered or noted or otherwise treated as an inclosure thereto.

Inclosure in Duplicate, etc., Constitutes But One Inclosure. An inclosure which is in duplicate, triplicate, etc., constitutes and is noted and otherwise treated as but one inclosure, in duplicate, triplicate, etc., and is not noted or otherwise treated as two, three, or more inclosures.

A communication with its inclosures, if any, which is inclosed with another communication constitutes and is noted and otherwise treated as one inclosure, *with* such number of inclosures as it may have, and is not noted or otherwise treated as two, three, or more inclosures.

Parts of Inclosure Arranged and Fastened Together. The several sheets or parts of an inclosure which consists of two or more sheets or parts, or is in duplicate, triplicate, etc., or has inclosures, are arranged in proper sequence and fastened together and maintained in that sequence.

Inclosures Arranged and Numbered. All inclosures to a communication, including those pertaining to the indorsements thereon, are arranged in proper sequence, numbered in a single series and maintained in that sequence.

The serial number of an inclosure which has been withdrawn from a communication is not to be given to any other inclosure to that communication. Should the withdrawn inclosure be replaced with the communication it is given its former number as an inclosure thereto.

Inclosure Notations, by Whom Made. Required notations on inclosures and notations on communications with reference to inclosures are made in the office in which the inclosures concerned originated as such or are added or withdrawn as such.

Notations on Inclosures, Where Placed. Notations required to be made on inclosures ordinarily are made on the face of each copy thereof in the lower left corner, but may be made elsewhere on the face or on the back when necessary or especially desirable in the particular case.

Notations on Inclosures, How Made. Each inclosure is noted thereon, ordinarily in lead pencil, but, when desirable, in ink—

The fact that it is an inclosure.

Its number in the inclosure series.

When desirable, it may also have noted thereon, similarly, such other matter as may be necessary to identify it with both the basic communication and the indorsement, if any, with which it was inclosed.

Examples:

"Incl 1."

"Incl 1, AG 300.33 (2-1-23) (6th Ind.)."

Inclosure Notations on Communications, Where Placed. Notations as to inclosures, if any, are made on the *face* of a communication below the body thereof and beginning at the left margin.

Notations as to Initial Inclosures. When inclosures are *first placed* with a communication, notation is made *below* the communication, or the indorsement, to which they pertain, showing the total number of such inclosures, followed by a list showing as to each—

Its number.

Its title, or a brief description of it, or both.

If it is in duplicate, triplicate, etc., that fact.

If it has inclosures of its own, that fact, with the total number of such inclosures.

Examples:

"1 Incl—
Draft of proposed AR 40-100, in duplicate."

"4 Incls—
Incl 1—W. D., A. G. O. Form No. 55, blank.
Incl 2—Letter A. G. 300.33 (2-1-23) in duplicate.
Incl 3—Report Board of Officers, in triplicate.
Incl 4—Letter 220.4, Hq. Second Corps Area Jan. 4/24, with 7 incls."

Notations as to Inclosures Added or Withdrawn. When, in connection with an indorsement thereto, inclosures are added to or withdrawn from a communication already carrying inclosures, notation is made below such indorsement showing—

The total number of inclosures finally accompanying, and which of them are in duplicate, triplicate, etc., or have inclosures.

The additions, including the total number added, and a list of those added.

The withdrawals, including the total number withdrawn and their numbers.

Example:

"6 Incls—Incl 2 in duplicate.
Incl 6 in triplicate.
Incl 8 in triplicate.
Added: 2 Incls—Incl 7—Report of Physical Examination.
Incl 8—Statement of testimony expected.
Withdrawn: 2 Incls—3 and 5."

Notation When no Inclosures Added or Withdrawn. When, in connection with an indorsement thereon, inclosures are not added to or withdrawn from a communication already carrying inclosures, a notation is made below such indorsement showing the number of inclosures accompanying, e. g.,: "7 Incls."

Inclosure Listed Once, Only. An inclosure once listed is not again listed on the same communication.

Inclosures in Separate Container. When necessary the assembled inclosures to a communication, each bearing its proper notation and all being noted on the communication, may be placed in a separate container so marked as to insure prompt identification with the communication to which the inclosures pertain, e. g., "Inclosures to A. G. 210.2 (2-1-23)."

Inclosures so placed in a separate container ordinarily are forwarded in the usual way with the communication to which they pertain. When necessary, however, they may be forwarded under separate cover, in which event the carbon or other copy of the communication to which they pertain, when practicable, accompanies the inclosures under the separate cover and the required inclosure notations on the communication to which they pertain contains appropriate special notations of the facts as to forwarding the inclosures and copy under separate cover.

Inclosures forwarded under separate cover continue to be considered, noted, and otherwise treated as inclosures to the communication from which they are so separated, and are not to be considered, noted or otherwise treated as withdrawn or otherwise permanently separated from such communication.

Nonmilitary Letters. Except with offices or individuals in or under the Navy Department, official correspondence with officers or individuals not in or under the War Department follows the general forms in use in good civilian practice.

Details. The principles previously described govern in official correspondence with offices and individuals not in or under the War Department or the Navy Department, except that—

The letter heading may contain "In reply, please address: (Official designation of writer)" at the upper left.

Ordinarily does not contain the form words "Subject" or "To," or the matter prescribed to follow the word "Subject," but when considered desirable may contain these.

As to the address, are in the form—

If to an individual, as such:

Mr. John W. Doe,
1234 Roe Street,
Chicago, Ill.

If to a Representative in Congress:

Honorable John W. Doe,
House of Representatives,
Washington, D. C.

If to the Governor of a State:

Honorable John W. Doe,
Governor of the State of New York,
Albany, N. Y.

The body of the letter—

Is introduced by an appropriate salutation, such as "Sir," "My dear Sir," "Dear Sir"; "My dear Madam," "Dear Madam," ("——— Madam" will ordinarily be used in addressing unmarried as well as married women); "Dear Senator," My dear Senator," etc.

Ordinarily does not contain any paragraph numbers.

Ordinarily when typwritten is double spaced, unless if so written it would cover more than one page, in which event it may be single spaced.

A complimentary close, such as "Respectfully," "Very respectfully," "Very truly," "Very truly yours," "Very sincerely," "Very sincerely yours," is used.

In lieu of regulations with reference to copies and records the following usually govern:

One carbon or other copy only is made, and this only in cases in which the communication is of such character as to warrant retaining a record thereof. If additional copies are required for special purposes, such as furnishing to some one concerned, etc., they will be made.

If the communication is of such character as to warrant retaining a record thereof, one carbon or other copy thereof is retained for the records of the writer. If the writer is an individual, the retained copy may be destroyed when no longer required by him.

Ordinarily no copy thereof will be forwarded with the communication, but one or more may be so forwarded when desirable in a particular case.

Indorsements ordinarily are not used, but when used may, when desirable, contain such expressions as "Respectfully referred," "Respectfully transmitted," "Respectfully forwarded," and "Respectfully returned."

"Secret" and "Confidential." The word "document" used herein applies to printed, mimeographed, typed, photostated, and written matter, and to maps, drawings, and photographs.

"Secret" Documents are marked "Secret" when the information they contain is of great importance and safeguarding same is of prime necessity.

"Secret" is placed on the document by, or by authority of, the Secretary of War, the Chief of Staff, a chief of a branch or an officer commanding a territorial department or corps area, a tactical division, or a higher tactical unit, and the mark is accompanied by designation of the authority affixing it, or by authority of which it is being affixed, and dated and initialed by the officer affixing it.

The officer to whom the document is officially intrusted is personally responsible for its safe custody and exercises every precaution to prevent unauthorized persons gaining knowledge of any kind concerning it.

Secret documents are inclosed in an inner and an outer cover. Inner cover (sealed wrapper or envelope) is addressed in usual way, plainly marked "Secret" in manner most readily seen when outer cover is removed, and containing a receipt form. Package is then inclosed in an outer cover, sealed and addressed in ordinary manner with no notation to indicate secret nature of contents.

They are transmitted by mail—registered—or when transmitted by hand, intrusted to an officer.

They are delivered to the officer to whom addressed or his authorized representative.

The inner cover is opened only by the officer to whom addressed, as far as practicable. The Receipt form is dated and signed and returned to the sender.

"Confidential" Documents are marked "Confidential" when of less importance and less secret nature than a "Secret" document, by a commissioned officer with designation of office held—except printed documents of War Department or of General Headquarters in the field.

Confidential documents are prepared for transmission the same as "Secret" except receipt form is used only when necessary. The inner cover may be opened by any responsible person, when so authorized.

The contents are disclosed only to those whose duties require it.

They are transmitted by registered mail when warranted or by hand—the same as "Secret."

"For Official Use Only" Documents. Contain information not for public or press. They are communicated to any person in service of the United States whose duties they concern or to persons of undoubted loyalty and discretion cooperating in Government work.

Filing of Correspondence. The Dewey Decimal System is authorized and installed for certain offices by order of The Adjutant General.

The Correspondence Book and Document File is used by organizations and Detachments less than a regiment.

Ink or an indelible pencil is used and the entries exhibit—Subject, Name of writer, Place and date, Date of forwarding and receipt, Disposition of original, and serial number.

A serial number is given each entry and document to which it relates, beginning with one; subsequent entries being numbered in sequence.

One or more spaces are left between entries.

Each document recorded is indexed alphabetically under its subject, and cross indexed when necessary. Each entry in index bears the same serial numbers of the documents related to it.

When filled and no longer current, correspondence books are placed with their respective documents in the permanent files of the organization.

A Document File supplements the correspondence book and includes copies of all communications sent and received, and indorsements.

Documents are numbered serially, beginning with one, and bear the same number as item and index entries in the Correspondence Book.

The Correspondence Book and Document File are inspected annually by the C. O. of the Post or an officer designated by him. Also by an officer of The Inspector General's Department when on an official visit. All obsolete or unnecessary papers are eliminated at this time.

Penalty Envelopes and Use of Mails. The following notations appear on an official envelope.

(Upper left hand corner-)
"WAR DEPARTMENT

____

____

Official Business"

(Upper right hand corner-)
"Penalty for Private Use to
Avoid Payment of Postage
$300."

The use of the Penalty "Stamp" in lieu of a regular stamp is authorized for all Official Communications and other mailable matter relating exclusively to public business, including 1. Business of a Post Exchange, but not to solicit business nor in the delivery of goods. 2. Purchase from company fund of articles solely for benefit of Company. 3. Army athletics. 4. Aid and voluntary contributions of persons interested in distribution of books for Chapel service.

Packages of Official Matter must not be more than 84 inches in length and girth combined, nor weigh more than four pounds. Exceptions; one book may be mailed regardless of weight, and the regulation does not apply to documents of War Department mailed in Washington, D. C.

Blank Forms. Below are listed some of the forms in common use; grouped in the following order—Adjutant General's Office, Medical Department, Quartermaster Corps, and Inspector General's Department. The form numbers in parenthesis are "old," and will gradually be dropped as new stocks are reprinted from time to time.

Form. No.	*Title and Description*
AGO 1 (332)	Company Morning Reports. One copy. Personnel Adjutant. A permanent record and utmost care should be exercised in its preparation. See AR 345–400.
AGO 2 (334)	Headquarters Morning Reports. See above remarks. AR 345–400.
AGO 3 (334a)	Supplementary Morning Reports. Same as Form 1. See AR 345–400.
AGO 5 (339)	Daily Sick Report. One copy. Sent to Commanding Officer of hospital. Returned to organization. See AR 345–415.
AGO 6 (343)	Duty Roster. One copy. Kept in Co. or Det. Should be closely supervised by the organization commander. See AR 345–25.
AGO 8 (668)	Correspondence Book. Not used where the War Department Correspondence File is authorized. See AR 345–620.
AGO 9 (703)	Monthly Roster. Four (or more) copies prepared by the Personnel Adjutant. Prepared monthly or at certain other intervals, such as the forming of an organization or the disbanding of same. One copy is kept in the Personnel Office for one month, then sent to the organization office for file. See AR 345–900.
AGO 13 (664)	Report of Enlistments. Two copies. Original to A. G. O. One filed. Rendered by the Recruiting Officer. See AR 600–750.
AGO 15 (196)	Report of Survey. Three copies. All copies sent to the appointing authority for approval, disapproval, or such other action as he may deem pertinent. Final disposition of copies as follows: One copy to the accountable officer, one copy to the Chief of Finance, and the third copy turned over to the corps area or department finance officer for the information of the property auditor. See AR 35–6640.
AGO 17 (383)	Requisition for Blank Forms and Publications. Rendered by the distributing agency only. See AR 310–200.

Form. No.	*Title and Description*
AGO 18 (384)	Estimate of Requirements. Same remarks as above. See AR 310-200.
AGO 21 (22)	Enlistment Record, Regular Army. One copy. To the A.G.O. Prepared by the Recruiting Officer for every soldier enlisted. Sent to the Personnel Adjutant for checking. After checking returned to R. O. for mailing. See AR 600-750.
AGO 22 (260)	Identification Record Card. One copy. Same procedure as above. See AR 40-1195.
AGO 23 (627)	Report of Enlisted Men Enlisted for, Reenlisted in, or Transferred to Certain Branches. One copy. Sent to the S. G. O. It is rendered immediately upon receipt of soldier's service record. Fact of mailing with date should be entered under remarks in service record of soldier concerned. See Sec. III, Cir. No. 24, W.D., 1923.
AGO 24 (29)	Service Record One copy. Prepared by the Recruiting Officer. Accompanies soldier until end of his enlistment. Then sent to the A. G. O. by the personnel adjutant. A very important record and great care as to accuracy and neatness should be used in its preparation. See AR 345-125.
AGO 25 (29a)	Extract from Service Record. One copy. Prepared upon transfer, detachment, or separation from the service. See AR 345-125.
AGO 26 (644)	Pay Card. One copy. Prepared by the Recruiting Officer. Kept in the personnel office. Accompanies the service record upon transfer, etc. See AR 345-150.
AGO 29 (18)	Authorization for Allotment or Deduction of Pay. Two copies. Original mailed by the personnel adjutant to Finance Officer, U. S. Army, Washington, D. C., if for an allotment of pay and in case of authorization of deduction for payment of insurance premiums is mailed to U. S. Veterans' Bureau, Washington, D. C. This is a double form, i. e. is printed on both sides. See AR 35-5540 and AR 600-100.
AGO 30 (19)	Notification of Discontinuance of Allotment or Deduction. Two copies. Same procedure as above. See AR 35-5540.
AGO 31 (66)	Furlough. Two copies. Original sent to Hq. for signature of C. O. Delivered to soldier until expiration

Form. No.	*Title and Description*
	of furlough. Then signed by company or detachment commander to certify date of return. Both copies to Finance Office. See AR 615–275.
AGO 32 (637)	Individual Clothing Record. One copy. In case of transfer original accompanies soldier. True copy made and kept until first visit of property auditor. See AR 35–6680 and AR 615–40.
AGO 33 (637)	Individual Equipment Record. See AR 35–6680 & AR 615–40.
AGO 35 (165)	Individual Clothing Slip. Two copies. Sent to Quartermaster. Used to draw clothing, etc. Data transferred to Form 32 and 33. See AR 35–6680 and AR 615–40.
AGO 36 (602)	Statement of Charges. Three copies by personnel adjutant. A separate Statement of Charges will be prepared for property of each supply branch. See AR 345–300.
AGO 38 (414)	Report of Discharge or Retirement of Enlisted Men, and Physical Examination prior thereto. Two copies. Signed by soldier concerned. Sent to the surgeon for physical examination of soldier. Then sent to the personnel adjutant for transmittal to A.G.O. along with service record and pay card. See AR 40–100.
AGO 39 (3)	Notification of Discharge. One copy. Sent to the Finance Officer that is designated to cash the final statements of the soldier concerned. Used in case no Finance Officer is located at the place soldier is discharged. See AR 345–465.
AGO 40 (17)	Certificate of Disability for Discharge. Two copies, except in case of original enlistment subsequent to Feb. 9, 1922, in which case one copy is required. Prepared by company commander. Sent to the board of medical officers through the officer convening the board. Then to the Corps Area commander. After discharge to the personnel adjutant who in turn sends it to the A.G.O. See AR 615–360 and AR 600–500.
AGO 41 (380)	Designation of Beneficiary. One copy. Prepared by the company or detachment commander. Sent to the personnel adjutant for transmittal to the A.G.O. Prepared in case of change of beneficiary subsequent to date of enlistment. See AR 600–600.
AGO 42 (380a)	Change in Address of Beneficiary or Next of Kin. Same remarks as above. See AR 600–600.

Form. No.	*Title and Description*
AGO 44 (631)	Report of Desertion. Three copies. By personnel adjutant who certifies as to soldier's allotments and insurance. Signed by commanding officer of post or regiment. Sent by personnel adjutant to the A.G.O. along with service record, etc. See AR 615-300.
AGO 49 (468)	Application for Retirement. Two copies. Original sent by the organization commander to the A.G.O. through the post or regimental commander along with information in his indorsement as to whether or not the soldier has lost any time under the 107th A.W. See AR 615-395.
AGO 52 (415)	Report of Death. Three copies. Prepared in case of death of any person subject to military law as defined in the 2nd A.W. See AR 600-550.
AGO 54 (34)	Inventory of Effects. Three copies. (See A.W. 112) Prepared in the case of every person whose effects are under the control of the military authorities. See AR 600-550.
AGO 55 (525)	Honorable Discharge from the Army of the United States. One copy. Signed by the soldier and the Personnel Adjutant then presented to a designated field officer or the commanding officer for signature. Must be presented to the finance officer paying final statement for proper notation as to fact of payment. See AR 345-470.
AGO 56 (526)	Discharge from the Army of the United States (Blue) One copy. Same remark as above. See AR 345-470.
AGO 57 (527)	Dishonorable Discharge from the Army of the United States. One copy. Same remark as above, with the exception that discharge is not delivered to soldier until his release from confinement. See AR 345-470.
AGO 58 (152)	Noncommissioned Officer's Warrant. One copy. Furnished the N.C.O., concerned. See AR 615-5 and 615-15.
AGO 59 (153)	Noncommissioned Officer's Warrant (Staff). One copy. Furnished the N.C.O. concerned. In case of reenlistment within the time limit and the warrant is continued in force the recruiting officer should indorse the warrant on the reverse side. See AR 615-5 and 615-15.

Form. No.	*Title and Description*
AGO 62 (88)	Application for Commission in the Regular Army. See AR 605-5; 605-10; 605-15, 605-20, 605-25 and 605-30.
AGO 63 (395)	Report of Physical Examination. One copy. Used for the annual physical examination of all officers, warrant officers, and members of the Army Nurse Corps. Used to record the physical examination of the above personnel prior to discharge, dismissal or resignation and at certain other intervals, such as promotion of officers. See AR 40-100 and 40-105.
AGO 64 (609)	Physical Examination for Flying. Three copies. Two sent to the Chief of the Air Corps. One retained by the flight surgeon. Used for recording the examination of all candidates for commission in the air corps and transfer of officers thereto. Used for the January and July examination of pilots and rated observers. See AR 40-110.
AGO 67 (711)	Efficiency Report. One copy. Rendered on June 30th or upon transfer of an officer provided he has served at least one month prior to his transfer. Rendered by the immediate military superior of the officer and sent to the next military superior for inspection and proper action. During first two years of service in case of an original commission this report will be rendered on Sept. 30th, Dec. 31st and March 31st, in addition to June 30th report. See AR 600-185.
AGO 71 (24)	Consolidated Strength Return. Two copies. Rendered by the post commander for the entire command. Original to the A.G.O. Copy filed. See AR 345-80.
AGO 73 (33)	Strength Return. Four copies. Rendered by the commanding officer of each branch of the service represented at a post or by the regimental commander in case of a medical regiment, etc. If the regiment is a member of a tactical unit an extra copy is required for the division commander. Original sent to the A.G.O., one copy to the S. G. O. and one copy to the Corps Area concerned. See AR 345-55.
AGO 75 (647b)	Memorandum of Transmittal. Two copies. Original to the A.G.O. This form is used by the personnel adjutant for transmitting all records of officers, warrant officers and enlisted men upon

Form. No.	*Title and Description*
	separation from the service. Used for the forwarding of copies of special and summary court-martial records, and reports of change and designation of beneficiary of the above mentioned personnel. See AR 345–800.
AGO 77 (647a)	Report of Change (Enlisted Men). Two copies. Original sent by the personnel adjutant to the A. G.O. along with memorandum of transmittal. Used to report joining, transfer, furlough, confinement, arrest, absence without leave, etc., of all enlisted personnel. Prepared by the personnel adjutant from data transcribed from the organization morning reports. See AR 345–800.
AGO 78 (648a)	Report of Change (Officers). Same remark as above. Used to report leaves of absence and return therefrom. If leave of absence is for a period greater than 10 days the personnel adjutant must report the address of the officer while on leave. See AR 345–800.
AGO 80 (649)	Report of Change, Detached Officers. Three copies if at a station under the jurisdiction of the corps area commander. Original to the S.G.O. direct. Copy to the corps area surgeon. Copy filed by the officer concerned. If at an independent station two copies are prepared. Original to the S.G.O. This applies to officers of the Medical Department. (This report should not be confused with an active duty report of members of the O.R.C., which is rendered on an improvised form.) See AR 345–800 and 605–120.
AGO 95 (594)	Charge Sheet (For Courts-Martial). Three copies. Any officer or soldier or any other person subject to military law may prefer charges. After preparation they are signed and affidavit completed as prescribed by A.W. 70. All copies are submitted to the commanding officer for investigation and such action as he deems appropriate in each case. If tried by summary court martial the three copies are disposed of as follows:—the original copy is filed at post headquarters, a copy is sent to the A.G.O. by the personnel adjutant and the third copy is sent to the officer exercising general court-martial jurisdiction over the command. See par 75 and Appendix 5, Manual for Courts-Martial.

Form. No.	*Title and Description*
AGO 97 (76)	Subpoena for Civilian Witness. Two copies. Usually service is made by an officer or noncommissioned officer. See Par. 160 and Appendix 19, M.C.M.
AGO 98 (60)	Interrogatories and Deposition. May be taken before and authenticated by any officer, military or civil, authorized by the laws of the United States or by laws of the place where deposition is taken, to administer oaths. See Par. 174-182 and Appendix 17, M.C.M.
AGO 103 (135-2)	Report of Physical Examination prior to Separation from Federal Service. Used for the physical examination of officers and enlisted men of the national guard called into active service of the United States immediately preceding their muster out of Federal Service. See Par. 80, AR 130-10.
AGO 105 (22-R)	Enlistment Record, Enlisted Reserve Corps. One copy. Mailed to the corps area or department commander to be kept until mobilization in case of an emergency, when this record will be sent to the camp or post commander to which reservist is ordered to report for active duty.
AGO 106 (260)	Identification Card, Enlisted Reserve Corps. One copy. The preparation of this record will be deferred until actual mobilization. This record along with Form 105 will be sent by the camp or post commander to the A.G.O. with the initial return of the organization or the first return after the reservist reports for duty.
AGO 107 (444-R)	Individual Report of Enlisted Reservist. One copy. This card is supplied by the corps area commander in which the reservist resides. Rendered on June 1st and December 1st in each year. Both temporary and permanent address must be given.
AGO 108	Noncommissioned Officer's Warrant, Enlisted Reserve Corps. One copy. To the N.C.O. concerned. May be appointed by the corps area commander unless army regulations direct that the appointment be by the Secretary of War or by the chief of the branch concerned.
AGO 110	Application for Appointment and Statement of Preferences for Reserve Officers. Two copies. If not assigned to a War Department activity or to activity under chief of branch, this form accomplished, is sent by the chief of branch to the corps area commander concerned. See Par. 19, AR 140-5.

Form. No.	*Title and Description*
AGO 111 (677-R)	Identification Card, Officers' Reserve Corps.
AGO 112	Personal Report of Reserve Officer. Prompt notification on this form of a permanent or prolonged temporary change of address is made to The Adjutant General through military channels. See Par. 67, AR 140-5.
AGO 115 (525-R)	Honorable Discharge from the Army of the United States, Enlisted Reserve Corps. One copy. To enlisted man concerned.
AGO 116 (526-R)	Discharge from the Army of the United States, (Blue). Same remarks as above.
AGO 117 (527-R)	Dishonorable Discharge from the Army of the United States, Enlisted Reserve Corps. Same remark.
AGO 121	Application to Enroll in a Citizens' Military Training Camp. One copy. In case of applicants from the Regular Army, National Guard and Organized Reserves the application should be sent through military channels. See AR 350-2200.
AGO 130	Report of Enrollment, Reserve Officers' Training Corps. See AR 145-10.
AGO 131	Student's Record, Reserve Officers' Training Corps. See AR 145-10.
AGO 132	Camp Training Certificate, Reserve Officers' Training Corps. One copy. Signed by the camp commander and delivered to the student concerned. See AR 145-10.
AGO 134	Military Training Certificate, Reserve Officers' Training Corps. See AR 145-10.
MD 21	Hospital laundry list. Copy sent to the S.G.O. with the voucher for laundry service in case the service is being done by a civilian or civilian laundry. A monthly report. See AR 40-590.
MD 42	Contract for laundry work (with appendix sheets "A"). Six copies. Three copies sent to the corps area or department surgeon for approval. Three additional copies prepared to be distributed as follows:- one copy to the contractor, one to the Department of the Interior and one copy to the S.G.O. to be sent to the finance officer who is to pay the account. See AR 40-590.
MD 49	Statement of the hospital fund. Two copies. Original to the S.G.O. through the corps area surgeon. See AR 210-50.

Form. No.	*Title and Description*
MD 49a	Employee's certificate of indebtedness for hospital service. Three copies. Marked "original," "duplicate" and "triplicate." Two copies to the officer under whom the employee is serving. One copy retained by the commanding officer of the hospital. See AR 40-495.
MD 51	Report sheet for report of sick and wounded. Two copies. Original with report cards or other records to the corps area surgeon for checking and then forwarded to The Surgeon General. Copy filed. See AR 40-125. Rendered within five days after the closing of a hospital or a command is discontinued, in addition to monthly report.
MD 52	Register card. Two copies. Original to corps area surgeon along with Form 51. See above and AR 40–1025, 40–1030 and 40–1050.
MD 52a	Index record of patients (card). Register index. One copy. Kept in the hospital and prepared by all hospitals in peace or war, wherever located. Also used for keeping the "Diagnosis Index" and other indices at fixed hospitals in addition to its use as a nominal index of patients. See AR 40-1070.
MD 52b	Emergency medical tag (20 in book). Used only in the field. Two copies. Original attached to all sick, wounded, and dead, as soon as practicable. See AR 40-1055. They are also used as prescribed in AR 40-1025.
MD 52c	Field medical card. One copy. Started at the first hospital in the field where treatment is furnished. Accompanies the patient until return to duty, or death, or arrival in the Zone of the Interior. Removed and sent with the monthly report of sick and wounded to the chief surgeon, or corps area surgeon, as the case may be, for transmittal to The Surgeon General. See AR 40-1060.
MD 52d	Field medical record, jacket. For field use. Used for inclosing the field medical card and emergency medical tag and any other clinical record of value. See AR 40-1060.
MD 54	Surgeon's request for service record. Used by the commanding officer of hospital to make direct call upon the proper organization commander for the soldier's service record in the event of failure to receive same in due time. AR 40-590.
MD 55a	Clinical record, brief. One copy. This form and 55j is used for every patient treated in hospital and for serious cases treated in quarters. See AR 40-1070. Note:-The other lettered blanks of the 55 series run to the letter "w" inclusive, with certain additional blanks for

Form. No.	*Title and Description*
	use in veterinary hospitals. For the sake of brevity they are omitted. For a complete list See AR 40-1005. Reference AR 40-1070 and 40-2235.
MD 56	Malarial register. One copy. Prepared for every case or carrier and should be kept up to date until patient is definitely cured or terminates his military service. In the event of transfer, accompanies the patient to his new post. See AR 40-230.
MD 57	Report of dental service. Rendered monthly from every station and separate command where a dental officer has been on duty during the month. If post is under the immediate control of the War Department report is sent direct to The Surgeon General. One copy retained. If forwarded through the corps area surgeon two copies are sent and one retained. See AR 40–1010.
MD 59	Report of examination for sergeant, staff sergeant, technical sergeant, or master sergeant, Medical Department. One copy. See AR 615-15.
MD 64	Morning report, Army Nurse Corps. Kept by the chief nurse of the hospital. See AR 40-20.
MD 65	Dental engagement slip. See AR 40-50.
MD 68	Nurses' bedside notes. Kept by the nurse. Are for temporary use. They are not filed with the clinical record, but may be destroyed or retained at the discretion of the commanding officer of the hospital. See AR 40-1070.
MD 71	Surgeon's morning report of sick. Signed each day by the medical officer responsible for its rendition. Sent to the personnel adjutant each day for entering the strength of the command. See AR 40-1005.
MD 72	Morning report of ward. Rendered each morning by the ward officer. Sent to the registrar along with clinical records, etc. of completed cases. See AR 40-590. (Not a permanent record).
MD 72a	Consolidated morning report of wards. Kept by the registrar of the hospital. See AR 40-590.
MD 73	Diet card. Prepared by the ward officer and sent to the hospital mess. See AR 40-590. (Not a permanent record).
MD 74	Mess account. Kept by the noncommissioned officer in charge. Filed at the end of every month with the hospital fund papers. See AR 40-590.
MD 75	Patient's property card. Two copies. Patient is given one and the other accompanies effects to the clothing room. See AR 40-590.

Form. No.	*Title and Description*
MD 76	Patient's property tag. Used for identification of bag or bundle. See AR 40-590.
MD 77	Venereal prophylaxis slip. One copy. Is authenticated daily by the officer in charge of the prophylactic station. May be destroyed after three months. See AR 40-235.
MD 78	Syphilitic register. Used for keeping record of treatment administered to those with a positive diagnosis of syphilis. See AR 40-235.
MD 79	Register of dental patients (card). Prepared for every person receiving dental treatment. See AR 40-1010.
MD 81	Immunization register. Two copies. Original given to the officer, nurse or warrant officer for their personal file. In case of enlisted men the original is sent to the organization commander for transcribing the necessary data to service record of the soldier concerned. Duplicate filed at hospital or given to soldier if he desires it. See AR 40-215.
MD 86a	Statistical report, first section, patients and hospitalization. Rendered by the surgeon of every separate station or command. See AR 40-1080.
MD 86b	Statistical report, second section, communicable diseases. Same remarks as above. See AR 40-1080.
MD 86c	Statistical report, third section, personnel and transportation. Same remark as above. See AR 40-1080.
QMC 47 (160)	Requisition (white). Four copies; three forwarded; one retained. Used in submitting requisitions for all supplies except those for which special forms are provided. See AR 35-6720.
QMC 51 (166)	Requisition for clothing in bulk. Three copies. All sent to commanding officer for approval, then to the quartermaster for issue. Used to requisition clothing in bulk for issue to the enlisted men. See AR 35-6720.
QMC 52 (166-A)	Statement of clothing charged to enlisted men. One copy. Used to list the names of enlisted men to whom clothing has been issued on requisition and the amount charged each. See AR 615-40 and AR 35-6720.
QMC 53 (167)	Combination blank requisition, invoice and receipt. Three copies. First of each quarter to commanding officer for approval, then to quartermaster for issue. Used to requisition the quarterly allowances of china and glassware, stationery and office supplies, and brooms, brushes, etc., and the semiannual allowance of cleaning and preserving materials. AR 35-6720.

Form. No.	*Title and Description*
QMC 57 (257)	Receiving report. This form is used:- As a voucher to the stock record account to cover receipt and acceptance of articles purchased. If purchased locally three copies are prepared and routed as follows: two copies to the finance officer designated to make payment; one copy retained and filed as a voucher to the stock record account, or As a voucher on which to take up property on the stock record account received by shipment, when shipping tickets covering the shipment are not received. Two copies are prepared; one retained and one sent to the property auditor of the corps area. See AR 35-6560.
QMC 59 (258-A)	Stock record card. One copy. This form is used by post, camp, station and organization supply officers for keeping their property accounts. (Not used by companies or detachments). See AR 35-6520.
QMC 62 (260)	Shipping ticket. When property is transferred from one accountable property officer to another, the property officer making shipment prepares four copies of Form 62, and routes the copies as follows: 2 copies to the consignee; 1 copy to the finance officer of the corps area in which consignee is located, and 1 copy filed as temporary voucher to stock record account pending return of receipted copy from consignee. Separate shipping tickets are prepared for property stored and issued by different supply branches. See AR 35-6560.
QMC 65 (261)	Over, short, and damaged report. Three copies. Used in effecting adjustments of discrepancies in property accountability that occur in storage or transit, or for making changes in nomenclature. When carrier accepts responsibility the copies are disposed of as follows: 1 copy filed with the corresponding shipping ticket, and 2 copies to the finance officer charged with the settlement of transportation accounts for the station. See AR 35-6640.
QMC 72 (P.& S. 223)	Ration return. Two copies. Submitted to the post, camp, or station commander at the end of the ration period, indicating the net number of rations due. Duplicate is filed. See AR 30-2210.

Form. No.	*Title and Description*
QMC 74 (227)	Memorandum receipt. Two copies. Original signed by the responsible person and returned to the accountable officer; one kept by the person receiving the property. May be used either as a credit or debit slip. See AR 35-6520.
QMC 75 (228)	Account of property on memorandum receipt. One copy. Used by accountable officers to maintain a record of property on memorandum receipt for which they are accountable. Postings to this account are made from Form 74. See AR 35-6520. Note:-Other forms used in connection with property such as W.D., AGO Forms 15, 32, 33, 35 and 36 will be found in proper order under A.G.O. blanks.
IGD 1 and 1a	Inventory and inspection report. Two copies. Prepared and signed in duplicate for presentation to the inspector at the time of his visit. See AR 20-35.
IGD 2 and 2a	Inventory and inspection report of public animals. In the case of unserviceable public animals, or in an emergency, such inventories are prepared whenever necessary and one copy forwarded to the commander having authority to appoint an inspector. See AR 20-35. Separate inventories are required for property pertaining to different supply branches. Public buildings, rifles, and public animals are inventoried singly.

Medical Department Reports in Letter Form. There are certain important reports of the Medical Department that cannot conveniently be made on a blank form. Accordingly, no effort has been made to devise a standard form for such reports and they are rendered in the customary letter form. Reports of this character include the sanitary report, the annual report of certain hospitals, the annual report of Medical Department service schools, and special, monthly, and annual reports of laboratories. The scope of these reports, except sanitary, is covered in AR 40-105.

The Sanitary Report. According to type, sanitary reports are classified as informal, special, monthly, annual, and general. See AR 40-275.

An *informal* sanitary report may be either oral or in the form of a brief written memorandum covering minor sanitary defects detected by the surgeon or medical inspector of the station or command during routine sanitary inspections, that require immediate correction. If written, only one copy need be prepared and forwarded to the local commanding officer.

A *special* sanitary report, in written form, covers occasional emergencies such as epidemics, or other grave sanitary defects, of which a local commanding officer should be immediately apprised. If sufficiently important an original and 4 carbon copies of this report are prepared. The original and 1 carbon are forwarded to the local commanding officer, 2 carbons are temporarily retained and accompany the next monthly sanitary report as an exhibit, and 1 copy is filed with the retained monthly sanitary report of the station.

A *monthly* sanitary report is a routine resumé of current sanitary and health conditions within a station or command, with a statement of such corrective measures as seem to be warranted. A regular sequence of headings is prescribed for this report, which is prepared in letter form. These reports are prepared in triplicate, 2 copies being forwarded and 1 retained for file in the permanent Medical Department records of the station or command. The report is addressed to the commanding officer of the station or command and forwarded in duplicate to the Adjutant General through military channels. The reports of exempted stations are forwarded through corps area commanders because such commanders must be kept informed as to all matters involving health conditions within their territorial limits. The Corps Area Surgeon withdraws one carbon copy for retention in his files. In transmitting sanitary reports all commanding officers are required to indorse thereon the action taken by them, particularly as regards sanitary defects or deficiencies reported.

The *annual* sanitary report is a complete sanitary survey of the station or command to which it pertains, and is forwarded not later than 10 days after the end of each calendar year. Every fifth year, beginning in 1930, the report will be complete in every detail. During intervening years reference to previous reports may be made, thus cutting down the volume of the report. Certain set headings for discussion are also prescribed for this report. These annual reports are forwarded in the same manner as are monthly reports.

A *general* sanitary report keeps higher authorities informed regarding general sanitary conditions and the general efficiency of Medical Department personnel, installations, etc. as viewed by medical inspectors. They are rendered by a medical inspector to his immediate superior, upon the completion of his inspection. The original copy of such report is transmitted through military channels to The Surgeon General. The number of carbon copies to be prepared depends upon the requirements of the immediate superior who receives the report. A medical inspector always furnishes the commanding officer of a station or command inspected with a statement in duplicate of all uncorrected irregularities and deficiencies observed by him during his inspection.

Medical History of a Station. A medical history of every permanent station is kept by the surgeon in a loose-leaf binder. The duplicates of all sanitary reports and the duplicate report sheets of the sick and wounded (MD Form 51) are filed therein in a single chronological sequence. Additional sheets for noting the occurrence of epidemic diseases and other data of general and sanitary interest are inserted as occasion requires, at their proper places in the chronological sequence. The prescribed record of the official indorsements on sanitary reports is invariably made on the duplicates filed in the medical history. This medical history, if properly maintained, readily gives one a clear picture, from month to month and year to year, in orderly sequence, of local vital statistics, sanitary conditions, and other matters affecting or relating to the health of all those serving at any local station. Along with the Register of Sick and Wounded and Clinical Records this medical history of the command is permanently preserved.

Disposition of Old Records. In addition to the above, medical and official publications of more or less permanent value are properly filed and preserved. Other records and papers not needed or useful in the transaction of public business and not of permanent value or of historical interest, including retained copies of reports and returns kept at military hospitals or other Medical Department formations or establishments, which are over five years old may, within one year thereafter, be reported to The Surgeon General for disposition under the provisions of the act of February 16, 1889 (25 Stat. 672), as amended by the act of March 2, 1895 (28 Stat. 933; Sec. 189, Mil. Laws, 1921). These acts substantially prohibit the destruction of any official records without prior sanction of a congressional committee. In asking The Surgeon General to obtain authority for the disposition of such records the report must fully describe the papers, state their dates or the periods covered by them, and, if known, the dates of the last calls for them.

Affidavits, Depositions, and Certificates. Documents of this character are frequently required in military administration, especially in the adjustment of matters relating to the loss of and damage to government property. The inexperienced clerk usually is at a loss as to the proper procedure to be followed in preparing such papers. Accordingly the following notes may prove helpful.

Affidavits. An affidavit is a statement or declaration reduced to writing and sworn or affirmed to before some officer who has authority to administer an oath.

An affidavit must be positive as to parties; as to a claim, its nature, how it arose, upon what it is grounded, and the amount, if any, involved. It must fully set forth the facts to be considered, grammatical construction giving way if necessary to clarity and plain statement.

The name of the deponent must be mentioned; the deponent being the party sworn.

What is called the *jurat* is that part of an affidavit where the officer certifies that the same was "sworn" before him. The jurat must state the day on which it was sworn and be signed by the officer administering the oath, with the addition of his official title. The affidavit must show on its face that it was made before some officer competent to administer oaths.

In the case of some notaries, the statutes conferring authority to take affidavits require also his *seal* to be affixed. Whenever such officer has an official seal he should affix it.

Signature of affiant. The affidavit must be subscribed (signed) by the deponent, and officially authenticated by the signature of the officer administering the oath.

Venue is the place where the affidavit is taken and must be stated to show that it was taken within proper jurisdiction. It is an essential part of every affidavit.

Forms. The following are acceptable:

1. Fort Myer, }
Virginia } ss.

Before me, a Summary Court, personally appeared (name and rank or status of deponent) who, having been duly sworn according to law, deposes and says:

That, etc. (setting out the matters to be alleged).

....

Signature of affiant.

Sworn to and subscribed before me this....day of..................

....

Signature and title of officer
administering the oath.

2. If the oath is taken before a *civil* official the venue is stated as follows:

State of Virginia }
County of Arlington } ss.

If the person administering the oath is a Notary Public the affidavit begins with "Before me, a Notary Public in and for the state and county aforesaid, personally appeared, * * * * * *"

The Notary accomplishes the jurat by affixing his official title and seal below his signature, and in addition usually states the date upon which his commission expires.

Depositions. A deposition differs from an affidavit in that in the former the opposite party is given an opportunity to cross-examine (question) the deponent on facts it is desired to bring out in the sworn statement. They are used exclusively in courts martial and similar legal proceedings. The prescribed form to be followed is set forth on pages 643 and 644 of the Manual for Courts Martial.

Certificates. These are very useful documents and follow no set form. They are utilized largely by commissioned officers in lieu of affidavits. Custom has quite firmly established the following principles:

1. The place and date where accomplished appear as the heading, followed by an initial clause "I hereby certify that * * * (cite the facts)". Signature and official rank and position of the officer follow the body of the certificate.
2. Same form as above except that the initial clause reads "This is to certify that * * *"

Administering the Oath. In *civil* circles one usually seeks the services of a Notary Public for the purpose of accomplishing a sworn statement.

In *military* circles the authority to administer oaths is set forth in the 114th Article of War, which reads as follows:

"Art. 114. Authority to administer oaths.—Any judge advocate or acting judge advocate, the president of a general or special court-martial, any *summary court-martial,* the trial judge advocate or any assistant trial judge advocate of a general or special court-martial, the president or the recorder of a court of inquiry or of a military board, any officer designated to take a deposition, any officer detailed to conduct an investigation, and the *adjutant* of any command shall have power to administer oaths for the purposes of the administration of military justice and for other purposes of military administration; and in foreign places where the Army may be serving shall have the general powers of a notary public or of a consul of the United States in the administration of oaths, the execution and acknowledgment of legal instruments, the attestation of documents, and all other forms of notarial acts to be executed by persons subject to military law."

CHAPTER XXII

MATHEMATICAL PRINCIPLES

Introduction. No medical soldier, especially a senior non-commissioned officer, can accurately keep and prepare the records and reports on the hospital fund, maintain his property balances, prepare statistical reports and charts, or assist in drawing up estimates on proposed alterations, additions and repairs to hospitals without at least an elementary knowledge of the principles of arithmetic. Accordingly, such basic knowledge is presupposed, and no effort has been made herein to write a treatise on the subject. Those who consider themselves deficient should study a standard book on common-school arithmetic. There have been assembled and given below only such tables and principles, sometimes difficult to locate, which if made accessible for quick reference purposes may at the same time stimulate an interest on the part of and prove helpful to those reviewing this subject in preparation for promotion examinations.

As a tour of service in our outlying possessions falls to the lot of many of our medical soldiers, certain data on topics relating to travel have also been included in this compilation.

Writing and Reading Numbers. A *Unit* is the standard by which we count or measure.

A *number* shows how many times a unit, or what part of a unit, is taken

An *abstract* number is a number used without reference to any particular unit.

A *concrete* number is a number with which the unit is named.

An *integer* number is a number applied to whole (not fractional) units.

Notation is the *writing* of numbers.

Numeration is the *reading* of numbers.

Kinds of notation are the *Arabic* or common, and the *Roman*.

Numerals are the characters used in any system of notation. The Arabic numerals are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Excluding 0, these numerals are sometimes called Digits.

The Roman numerals are I, V, X, L, C, D, M.

Place Value. In a number written in Arabic numerals its value depends upon its position in the group of figures. On the contrary, numerals in the Roman system have no such place value.

Order of Units. Each successive place in a number that may be occupied by a figure has a definite value.

In the Arabic system this increase of value is in multiples of ten, on the decimal principle. The regular order is as follows: Units, tens hundreds, thousands, etc.

The Arabic System of Notation. This is the system universally employed. It is called Arabic because it came to Europe through the Arabs. The characters in the Arabic system, sometimes called *figures* or *ciphers,* originated in India. Without the *zero* they were employed more than 2,000 years ago, and the *zero* or *naught* has been in use over 1200 years. These figures did not become generally used until about 400 years ago when they finally displaced the clumsy notation of the ancient Romans.

In the Arabic System, the numbers *one, two, three, four, five, six, seven, eight,* and *nine,* are represented by the symbols 1, 2, 3, 4, 5, 6, 7, 8, and 9, respectively.

The symbol 0, read *zero, cipher,* or *naught,* when standing by itself, signifies nothing.

The above symbols are called *Figures.*

Zero, and the numbers one, two, three, four, five, six, seven, eight, and nine, are called *Digits.*

Numbers greater than nine are represented by writing side by side two or more of the above figures.

The last figure at the right is said to be in the first place, and denotes ones or units.

The figure just before the last is said to be in the second place, and denotes tens, and so on up to hundreds, thousands, etc.

Thus in this system the value of any digit depends on its position relative to other digits—the value of a digit being *multiplied* by *ten* for every digit placed to the right of it. Similarly, in decimal fractions, the value is *divided* by *ten* for every digit placed to the left of a numeral (on the righthand side of the decimal point). The following table illustrates this point:

Units	1.
Tens	10.
Hundreds	100.
Thousands	1,000.
Ten-thousands	10,000.
Hundred-thousands	100,000.
Millions	1,000,000.
Tenths	.1
Hundredths	.01
Thousandths	.001
Ten-thousandths	.0001
Hundred-thousandths	.00001
Millionths	.000001

It is customary to divide integral numbers into groups of three with commas, counting from right to left. Decimals are represented differently, ciphers being added when necessary to express the fractional part desired, thus: .001 equals one thousandth.

The Roman System of Notation. In this system of notation seven capital letters of the alphabet are used in lieu of figures, viz:

Letters	I	V	X	L	C	D	M
Values	1	5	10	50	100	500	1000

Numbers other than the above are represented by writing side by side two or more of the above letters.

When thus expressed, if a letter is written *after* another letter of the same or of greater value, the sum of their values is represented (e. g. VI = 6); if a letter is written *before* another letter of greater value, the difference of their values is represented (e. g. IV = 4); if letters of *equal* value are used *side by side* they are added (e. g. II = 2); if a letter of *smaller* value is placed *between* two letters of *larger* value, the value of the smaller is subtracted from the sum e. g. MCM = 1900).

Roman numerals are seldom used, and then only in a somewhat limited field, such as in numbering chapters of books, placing dates on cornerstones, inscribing hours on clock-dials, and naming Kings, Popes, etc.

The following table shows the methods usually employed in representing numbers up to two thousand:

Roman	Arabic	Roman	Arabic	Roman	Arabic
I	1	XV	15	C	100
II	2	XVI	16	CC	200
III	3	XVII	17	CCC	300
IV	4	XVIII	18	CCCC	400
V	5	XIX	19	D	500
VI	6	XX	20	DC	600
VII	7	XXI	21	DCC	700
VIII	8	XXX	30	DCCC	800
IX	9	XL	40	DCCCC or CM	900
X	10	L	50	M	1000
XI	11	LX	60	MD	1500
XII	12	LXX	70	MDCCCLXXXI	1881
XIII	13	LXXX	80	MCMXXVII	1927
XIV	14	XC	90	MM	2000

Multiplication Table. This table is used as explained in the following example: To find the product of 11 and 12 look in the left-hand vertical column for 11; then the product required will be found in the corresponding horizontal line in the column headed 12, the result found is 132.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144
13	26	39	52	65	78	91	104	117	130	143	156
14	28	42	56	70	84	98	112	126	140	154	168
15	30	45	60	75	90	105	120	135	150	165	180
16	32	48	64	80	96	112	128	144	160	176	192
17	34	51	68	85	102	119	136	153	170	187	204
18	36	54	72	90	108	126	144	162	180	198	216
19	38	57	76	95	114	133	152	171	190	209	228
20	40	60	80	100	120	140	160	180	200	220	240
21	42	63	84	105	126	147	168	189	210	231	252
22	44	66	88	110	132	154	176	198	220	242	264
23	46	69	92	115	138	161	184	207	230	253	276
24	48	72	96	120	144	168	192	216	240	264	288

Decimal Fractions. A decimal is a fractional part of one hundred, divided in multiples of *tenths, hundredths, thousandths,* etc. Decimals are expressed by placing a period before a single digit to indicate tenths, before two digits to indicate hundredths, and so on; or, counting from left to right from the decimal point. Following is a table of the most common fractions with their decimal equivalents:

1/16	.0625	1/8	.125
3/16	.1875	3/8	.375
5/16	.3125	5/8	.625
7/16	.4375	7/8	.875
9/16	.5625	1/6	.16⅔
11/16	.6875	5/6	.83⅓
13/16	.8125	1/3	.33⅓
15/16	.9375	2/3	.66⅔
1/12	.08⅓	1/4	.25
5/12	.41⅔	3/4	.75
7/12	.58⅓	1/2	.5
11/12	.91⅔		

Percentage. Percentage is the process of computing by per cents. The expression *Per Cent* signifies hundredths.

Thus, 6 per cent of any number is the same as .06 of the number.

The symbol % stands for *per cent.* Thus, 6% means 6 per cent; 12½% means 12½ per cent; and so on.

The *Base* is the number of which the per cent is taken.

The *Rate Per Cent* is the fraction which denotes how many hundredths are taken.

The *Percentage* is the result.

For example, 6% of $25 = .06 of $25 = $1.50.

In this case, the base is $25, the rate per cent is 6%, or .06, and the percentage is $1.50.

The following table is very useful and worthy of being committed to memory:

Per cent.	Fraction.	Per cent.	Fraction.	Per cent.	Fraction.	Per cent.	Fraction.
6¼	1/16	20	1/5	40	2/5	70	7/10
8⅓	1/12	25	1/4	50	1/2	75	3/4
10	1/10	30	3/10	60	3/5	80	4/5
12½	1/8	33⅓	1/3	62½	5/8	87½	7/8
16⅔	1/6	37½	3/8	66⅔	2/3	90	9/10

Square Root and Cube Root. The *square* of a number is the product obtained by multiplying the number by itself once (4 x 4 = 16; the square of 4 = 16); its *square root* is, on the contrary, that number which when multiplied by itself will give the number at hand (the square root of 16 = 4, for 4 multiplied by itself = 16.) Similarly, the *cube* of a number is the product obtained by multiplying the number by itself twice (or using the number three times: 4 x 4 x 4 = 64; the cube of 4 = 64); and its *cube root* is that number which when cubed will give the number at hand (the cube root of 64 = 4, for 4 cubed = 64).

A table of the squares, square roots cubes, and cube roots of numbers from 1 to 20 follows:

No.	Square	Square Root	Cube	Cube Root
1	1	1.	1	1.
2	4	1.414	8	1.259
3	9	1.732	27	1.442
4	16	2.	64	1.587
5	25	2.236	125	1.71
6	36	2.449	216	1.817
7	49	2.645	343	1.912
8	64	2.828	512	2.
9	81	3.	729	2.08
10	100	3.162	1000	2.154
11	121	3.316	1331	2.224
12	144	3.464	1728	2.289

No.	Square	Square Root	Cube	Cube Root
13	169	3.605	2197	2.351
14	196	3.741	2744	2.41
15	225	3.873	3375	2.466
16	256	4.	4096	2.519
17	289	4.123	4913	2.571
18	324	4.246	5832	2.62
19	361	4.358	6859	2.668
20	400	4.472	8000	2.714

Measures of Length. Measures of Length, or Linear Measures, are those used in measuring lengths or distances.

Table of Linear Measure

12 inches (in.) = 1 foot. (ft.)
3 feet = 1 yard. (yd.)
5½ yards = 1 rod. (rd.)
320 rods = 1 mile. (mi.)

Linear Measure Equivalents

mi.	rd.	yd.	ft.	in.
			1 =	12
		1 =	3 =	36
	1 =	5½ =	16½ =	198
1 =	320 =	1760 =	5280 =	63,360

Relevant Notes. A *furlong* = 40 rods. (Used in indicating distance in horse-racing).

A *league* = 3 miles. (Seldom used, except in Poetry to signify "a long ways").

A *fathom* = 6 feet. (Originally the greatest spread of a man's arms and used in measuring depths of water).

A *cable-length* = 120 fathoms. (Used in measuring depths of water and lengths of cordage and cables).

A *marine league* is equal to 3 nautical miles.

A *line* = 1/12 inch.

A *hand* = 4 inches. (Supposed width of a man's palm and used in measuring height of horses taken at shoulder.)

A *size* = ⅓ inch, length, and ¼ inch, girth, in measuring shoes.

A *span* = 9 inches.

A *cubit* = 18 inches.

A *nautical mile, geographical mile,* or *knot* is equal to 1.152 common or statute miles, or 6080.27 ft., and is used in measuring distance at sea.

Carpenters, mechanics, and other artisans usually write ′ for feet and ″ for inches; e. g. 3′6″ for 3 feet 6 inches.

Cloth Measure.

Table

2¼ inches = 1 nail.
4 nails = 1 quarter of a yard.
4 quarters = 1 yard.
3 quarters = 1 Ell Flemish.
5 quarters = 1 Ell English.

Surveyors Linear Measure. In measuring land, surveyors use a *chain,* whose length is 4 rods, or 66 feet, long. This chain has 100 links, each 7.92 inches long. The Surveyors Linear Table (see square table next paragraph) is as follows:

Table of Surveyors Linear Measure

7.92 inches (in.) = 1 link (l.)
25 links = 1 rod (rd.)
100 links = 1 chain (ch.)
80 chains = 1 mile (mi.)

Surveyors Linear Measure Equivalents

			l.	in.
		rd.	1 =	7.92
	ch.	1 =	25 =	198
mi	1 =	4 =	100 =	792
1 =	80 =	320 =	8000 =	63,360

Measures of Area. Measures of Area, Surface Measures, or Square Measures, are those used in measuring areas.

Table of Common Square Measure

144 square inches (sq. in.) = 1 square foot. (sq. ft.)
9 square feet = 1 square yard. (sq. yd.)
30¼ square yards = 1 square rod. (sq. rd.)
160 square rods = 1 acre. (A)
640 acres = 1 square mile. (sq. mi.)

Common Square Measure Equivalents

sq. mi.	A.	sq. rd.	sq. yd.	sq. ft.	sq. in.
				1 =	144
			1 =	9 =	1,296
		1 =	30¼ =	272¼ =	39,204
	1 =	160 =	4,840 =	43,560 =	6,272,640
1 =	640 =	102,400 =	3,097,600 =	27,878,400 =	4,014,489,600

Table of Surveyors Square Measure

16 square rods (sq. rd.) = 1 square chain (sq. ch.)
10 square chains = 1 acre (A)
640 acres = 1 square mile (sq. mi.)
1 square mile = 1 section (sec.)
36 sections = 1 township (T.)

Surveyors Square Measure Equivalents

sq. mi.	A.	sq. ch.	sq. rd.
		1 =	16
	1 =	10 =	160
1 =	640 =	6,400 =	102,400

Relevant Notes. A *Square* = 100 square feet, the term being employed in measuring flooring, roofing, etc.

A *Rood* = ¼ acre or 40 square rods.

A *square chain* = 1/10 acre, or 16 square rods.

An acre if measured off in a perfect square, is a piece of land measuring 208⅔ feet on each side.

A *township,* consisting of 36 square miles, is the unit employed in surveying public lands. Each township is divided by lines running at right angles to each other, into 36 sections, each 1 mile square, and containing 640 acres. *Sections* are further divided into quarter sections, each containing ¼ square mile or 160 acres, and into quarter quarter-sections, or eighth sections, each containing ⅛ square mile, or 80 acres.

Measures of Volume. Measures of volume or cubic measure are those used in measuring solid contents.

Table of Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet (wood) = 1 cord (cd.)

Relevant Notes. A *perch,* used in measuring stone or brick, contains 24¾ cubic feet.

A *perch of masonry* (stone) is 16½ ft. long, 1½ ft. wide and 1 ft. high.

A cubic yard of earth, sand, or gravel is considered a load.

The dimensions of a cord of wood, cut for fuel, are 8 ft. by 4 ft. by 4 ft., thus equalling 128 cubic feet.

A *cord foot* = 16 cubic feet; 8 cord feet = 1 cord.

A short ton of hard coal measures from 35 to 37 cubic feet; of soft coal about 42 cubic feet.

Measures of Capacity. These measures include those for liquids (Common Liquid Measure) in general use commercially, those for solids (Dry Measure), such as fruit, grain, vegetables, etc. and the apothecaries liquid measure used only in compounding medicines.

Table of Common Liquid Measure

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
31½ gallons = 1 barrel (bbl.)
63 gallons = 1 hogshead (hhd.)

Common Liquid Measure Equivalents

bbl.	gal.	qt.	pt.	gi.
			1 =	4
		1 =	2 =	8
	1 =	4 =	8 =	32
1 =	31½ =	126 =	252 =	1008

Table of Dry Measure

2 pints (pt.) = 1 quart (pt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Dry Measure Equivalents

bu.	pk.	qt.	pt.
		1 =	2
	1 =	8 =	16
1 =	4 =	32 =	64

Table of Apothecaries Liquid Measure
(Used by physicians and pharmacists)

60 minims (♏) = 1 fluid drachm (f. ʒ.)
8 fluid drachms = 1 fluid ounce (f. ℥.)

16 fluid ounces = 1 pint (O)
8 pints = 1 gallon (Cong.)

Relevant Notes. In computing the capacity of bins, 1 bushel is considered the equivalent of 1¼ cubic feet, or 2150.4 cubic inches; or to express it differently, 1 cubic foot will accommodate about 4/5 bushel.

Casks holding from 28 gallons to 43 gallons are called barrels.

Casks holding from 54 gal. to 63 are called hogsheads.

Whenever barrels or hogsheads are used as *measures*, a barrel means 63 gallons.

In computing the capacity of a cistern 231 cubic inches is taken as the equivalent of a gallon, and 4½ cubic feet as a barrel. 1 cubic foot will accommodate nearly 7½ gallons.

A dry quart contains 67.2 cubic inches. A liquid quart contains only 57.75 cubic inches.

In measuring grain, seeds, and small fruits (e. g. berries) it is customary to make the measure *even* full, and in measuring apples, potatoes and other large articles to have the measure *heaping* full.

U. S. Weight Equivalents

1 bushel corn = 56 lbs.
1 bushel oats = 32 lbs.
1 bushel onions = 57 lbs.
1 bushel potatoes = 60 lbs.
1 bushel wheat = 60 lbs.

Measures of Weight. These include Avoirdupois, Troy, and Apothecaries Weights.

Avoirdupois Weight is used in weighing all common articles. It is our established business or commercial weight.

Table

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
20 hundredweight = 1 ton (T.)

Troy Weight is used in weighing gold, silver, and jewels. Goldsmiths, silversmiths, jewelers, and United States mints employ it.

Table

24 grains (gr.) = 1 pennyweight (dwt.)
20 pennyweight = 1 ounce (oz.)
12 ounces = 1 pound (lb.)

Apothecaries' Weight is used by druggists in compounding medicines.

Table

20 grains (gr.) = 1 scruple (℈)
3 scruples = 1 drachm (ʒ)
8 drachms = 1 ounce (℥)
12 ounces = 1 pound (℔)

Relevant Notes. The ton of 2,000 lb. is sometimes called the *short ton,* there being an old ton of 2,240 lb., known as the *long ton* or *gross ton,* which is used in the United States Customs and in some wholesale transactions in mining products.

There is also the long hundred weight of 112 lbs., but it is rarely used except in English trade.

A ton of loose hay fills about 8 x 8 x 8 feet, or 512 cu. ft., of space, but this varies greatly with the condition of the hay.

A load of old hay weighs 2016 lbs.; of new hay 2160 lbs.

A keg of nails, a cental of corn, or a quintal of fish weighs 100 lbs.

A barrel of flour weighs 196 lbs., a barrel of salt 280 lbs., and a barrel of pork 200 lbs.

In all three systems of weights the grain is the same, but the ounce varies, there being 437½ grains in the avoirdupois ounce and 480 grains in the troy or apothecaries' ounce.

A pound avoirdupois contains 7,000 grains, and a pound troy or apothecaries' 5,760 grains.

Hence the *pound, ounce,* and *grain* in troy weight have the same weight as in apothecaries' weight.

A quarter = 25 pounds av. A stone = 14 pounds av. A pig = 21½ stone. A fother = 8 pigs.

Diamond Weight. 4 quarters = 1 grain. 4 grains = 1 carat.

A grain, diamond weight, is equal to four-fifths of a grain troy, and a carat is equal to 3 1/5 grains troy.

The word *carat,* meaning 1/24, is used also in speaking of the purity of gold. Hence 18 carats *fine* means 18/24 pure gold and 6/24 alloy.

Measures of Time.

Table of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (h.)
24 hours = 1 day (d.)
7 days = 1 week (wk.)
365 days = 1 common year (y.)
366 days = 1 leap year
100 years = 1 century.

Time Measure Equivalents

Min. Sec.
Hr. 1 = 60
Da. 1 = 60 = 3,600
Wk. 1 = 24 = 1,440 = 86,400
1 = 7 = 168 = 10,080 = 604,800
1 Yr. = 12 Mo. = 365 = 8,760 = 525,600 = 31,536,000
366 = 8,784 = 527,040 = 31,622,400

Relevant Notes. A fortnight is 2 weeks. A decade is 10 years. There are 12 months (mo.) or about 52 weeks in a year. The names of the months, called calendar months, are:

	days		days
1. January (Jan.)	31	7. July	31
2. February (Feb.) ..	28 or 29	8. August (Aug.)	31
3. March (Mar.)	31	9. September (Sept.) ...	30
4. April (Apr.)	30	10. October (Oct.)	31
5. May	31	11. November (Nov.)	30
6. June	30	12. December (Dec.)	31

The number of days in each month may be easily remembered by committing to memory the following jingle:

"Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
Except the second month alone,
Which has but twenty-eight, in fine,
'Till leap year gives it twenty-nine."

A *solar year* is the time required for the sun, after leaving either equinox, to return to it again; and is 365 days, 5 hours, 48 minutes, and 45.5 seconds.

A *sidereal year* is the time required for the earth to make a complete revolution about the sun; and is 365 days, 6 hours, 9 minutes, and 8.9 seconds.

A *common, civil,* or *legal year,* is one of 365 days; and a *leap,* or *bissextile year* is one of 366 days.

As there are but 365 days in a common year, a common year lacks nearly ¼ of a day of being a solar year, and this defect is made up by reckoning for some years (leap years) 366 days.

The leap years are the years whose dates are exactly divisible by 4; except in the case of complete hundreds, and these are leap years if exactly divisible by 400. Thus, 1600 and 1904 were leap years; 1800 and 1900 were not.

If the number of any year is divisible by 4, the month of February has 29 days, and it is a *leap year;* unless the "hundred rule" above mentioned applies.

By the *Julian Calendar,* instituted by Julius Cæsar, every fourth year is made a leap year; which produces an error, as compared with the solar year, of 44 minutes and 41.2 seconds in four years, or about one day in 129 years.

By the *Gregorian Calendar,* instituted by Pope Gregory XIII, in 1582, those years only are leap years whose numbers are divisible by 4, and not by 100, unless they are also divisible by 400.

The error of the Gregorian Calendar amounts to about one day in 3,866 years.

The reckoning of time by the Julian Calendar is termed *Old Style,* and by the Gregorian Calendar *New Style.*

The latter is used by most civilized nations.

The present difference between the two styles is 12 days.

Standard Time. This has been recognized by the United States since 1883, and in 1918 was made legal throughout the country by Act of Congress.

Standard time is regulated according to the meridians of 75°, 90°, 105° and 120°, longitude west from Greenwich, England; the place on which practically all maritime nations base their longitudinal reckonings. These are called, respectively, *Eastern, Central, Mountain,* and *Pacific* time.

Eastern Standard Time is legal from the Atlantic Ocean to a map line drawn from Toledo, (Ohio) above to Apalachicola (Florida) below.

Central Standard Time is used from the termination of Eastern Time to a line drawn from Mandan (North Dakota) above to the western boundary of Texas below.

Mountain Time extends from the latter line to a line running from the western boundary of Montana above to Yuma, (Arizona) below.

Pacific Time extends from this line to the Pacific Ocean.

Usually we write 20 minutes after 11 in the forenoon thus: 11 hr. 20 min. A.M., 11.20 A.M., or 11:20 A.M. We usually write 10 minutes before 3 in the afternoon thus: 2 hr. 50 min., P.M., 2.50 P.M., or 2:50 P.M.

Day-Light Saving Time. While not nationally recognized many communities adopt local ordinances for day-light saving during the summer months. This sends workers to their tasks one hour earlier than those using standard time, and thus after the allotted hours of work, permits them, as the name implies, to enjoy some measure of sun-shine and play before dark. Day-light Saving Time is therefore one hour later than Standard Time, so that 6:00 P.M. Eastern Standard Time is 7:00 P. M. Eastern Day-light Saving Time.

Differences in Time Between Places. Since there is a difference of 4 minutes in time for every degree of longitude, when it is 12 o'clock noon (U. S. Eastern Standard Time) at Washington, D. C. the clocks at other leading cities at home and abroad read as follows:

Berlin, Germany,	6:00 p. m.
Bombay, India,	10:30 p. m.
Chicago, Ill.,	11:00 a. m.
Denver, Colo.,	10:00 a. m.
Hongkong, China,	1:00 a. m. (the next day)
Honolulu, H. T.,	6:30 a. m.
London, England,	5:00 p. m.
Manila, P. I.,	1:00 a. m. (the next day)
Paris, France,	5:00 p. m.
San Francisco, Calif.	9:00 a. m.
Yokohama, Japan,	2:00 a. m. (the next day)

Since Central Time is one hour earlier than Eastern, Mountain Time two hours earlier, and Pacific Time three hours earlier, one turns the hands of his watch back one hour on three different occasions while traveling from New York to San Francisco, and correspondingly ahead if traveling from San Francisco to New York.

Furthermore, all adjustments in time are made when crossing the 180th meridian at sea.

For instance, in traveling on an Army transport from San Francisco to Manila one whole day is dropped as the ship passes the 180° meridian (the International Date Line, an imaginary point exactly one-half the distance around the world from Greenwich, England, the meridian of which is 0°.) A person aboard goes to bed at the usual hour on, let us say, Tuesday night, and after the customary 8 hours of sleep awakes to find that it is Thursday, instead of Wednesday, morning.

On returning from Manila to San Francisco the conditions are reversed. We may have *two* Wednesdays or *two* Sundays, depending upon the day the ship crosses the "line". It once happened that a transport reached the 180th meridian on Christmas, and the passengers for a period of 48 hours enjoyed the unique experience of celebrating two Christmas days.

Time on Shipboard. Time on Army transports and all other ships, at least insofar as the crew are concerned, is indicated by striking a bell. The hours of the day are divided into certain "watches" corresponding to what we landlubbers would call a "duty schedule". Normally a watch is on duty for 4 hours at a time, and at every half hour of a watch the bell is struck, once for the first half hour of the watch, twice for the second half hour, and so on up to the hour when the bell is struck 8 times, at the end of the watch, or tour of duty.

Beginning at midnight, and uniformly employed by all ships, the rotation is as follows, being repeated each time after the bell has been struck 8 times at the proper interval.

Bells	Time A. M.	Bells	Time A. M.	Bells	Time A. M.
1	12:30	1	4:30	1	8:30
2	1:00	2	5:00	2	9:00
3	1:30	3	5:30	3	9:30
4	2:00	4	6:00	4	10:00
5	2:30	5	6:30	5	10:30
6	3:00	6	7:00	6	11:00
7	3:30	7	7:30	7	11:30
8	4:00	8	8:00	8	12:00 noon

And so on, in rotation, through the P. M. hours.

Difference in Time Between Two Dates. The following method is largely used by business men:

The year is regarded as consisting of 12 months of 30 days each.

The months are represented by their numbers; thus, January is the first month, February the second, etc.

The difference in time is then found as in subtraction of denominate numbers.

Example. Find the difference in time between Oct. 15, 1924 and June 7, 1927.

$$\begin{array}{rrr} 1927 & 6 & 7 \\ 1924 & 10 & 15 \\ \hline 2 & 7 & 22 \end{array}$$

June is the sixth month of the year, and October the tenth month. 15 d. from 37 d. leaves 22 d. 10 mo. from 17 mo. leaves 7 mo. 1924 from 1926 leaves 2 y. Then the required result is 2 y. 7 mo. 22 d.

Note: In computing the above we had to "borrow" 30 days from the month column, thus leaving 5 instead of 6 months; as 10 cannot be subtracted from 5 we again had to "borrow" 12 months from the year column, thus leaving the latter read 1926 instead of 1927.

In some States, *the actual number of days* in the preceding month must be used, when the number of days in the subtrahend time is greater than the number in the minuend time.

Thus, in the above example, the month preceding June (i. e. May) has 31 days.

We should then say, 15 d. from 38 d. leaves 23 d.; and the time would be 2 y. 7 mo. 23 d.

Holidays. There are certain days in the calendar that are recognized as public holidays, either nationally or by most States.

In the United States they are:

January 1	New Year's Day (nationally).
February 12.	Lincoln's birthday.
February 22.	Washington's birthday (nationally).
May 30.	Memorial or Decoration Day.
July 4.	Independence Day (nationally).

First Monday in September, Labor Day.

October 12.	Columbus Day.

Last Thursday in November. Thanksgiving Day (nationally).

December 25. Christmas Day (nationally).

In addition there are two days not recognized as holidays which are quite generally celebrated by the younger generation, viz:

February 14. St. Valentine's Day.

October 31. Halloween.

Circular Measures. Angular measures and Arc measures are used in measuring angles and areas of circles.

Table of Angle Measure

60 seconds (") = 1 minute (')
60 minutes = 1 degree (°)
360 degrees = 4 right angles

Table of Arc Measure

60 seconds (") = 1 minute (')
60 minutes = 1 degree (°)
360 degrees = 1 circumference

Relevant Notes: It will be observed that angle measures and arc measures are practically the same. A quadrant is an arc of 90°. A circumference is an arc of 360°. A right angle is an arc of 90°.

A degree of the circumference of the earth at the equator—the length of a degree (1/360) of the earth's equator—contains 60 geographical miles, or 69 1/6 statute miles.

A *circle* is a plane figure bounded by a curved line all points of which are equally distant from a point within.

A *circumference* is the bounding line of a circle.

A *center of a circle* is the point from which all points in the circumference are equally distant.

An *arc* is any portion of a circumference.

A *diameter* is a straight line drawn through the center of a circle and terminated at both ends by the circumference.

A *radius* is a straight line drawn from the center of a circle to any point in the circumference; it equals half a diameter.

A *right angle* is the angle at the center of a circle corresponding to one-fourth of a circumference; the two lines forming a right angle are *perpendicular* to each other.

An *acute* angle is less and an *obtuse* angle greater than a right angle.

Board Measure. A board one inch or less in thickness is sold by the square foot and is said to have as many *board feet* as there are square feet in its surface.

If it is more than an inch in thickness, the number of board feet is found by multiplying the number of square feet in its surface by the number of inches in its thickness.

A piece of square lumber is measured in the same manner.

In measuring a board that tapers, the width is taken as one-half the sum of the width of the two ends, or by taking the measurement at the point considered the average width.

Unless sawed to order the width of a board ordinarily is computed only to the next smaller half inch. Thus 6 3/8 in. is considered 6 inches; 8¾ in. as 8½ inches.

To summarize: 1 board foot = 1 ft. × 1 ft. × 1 in. = 1/12 cubic foot = 144 cubic inches.

50 cubic feet of timber is considered a load.

Boards are usually sold at a certain price per hundred (C.) or per thousand (M.) board feet.

Measurement of Round Timber. To find the side of the square timber that can be sawed from a log, multiply the diameter of the smaller end by .707.

To find the number of board feet in the squared timber than can be sawed from a log, multiply together one-half the length in feet, the diameter of the smaller end in feet, and the diameter of the smaller end in inches.

Miscellaneous Measures.

Number Table

12 units = 1 dozen.
12 dozen = 1 gross.
12 gross = 1 great gross.
20 units = 1 score.

Paper Table

24 sheets = 1 quire.
20 quires = 1 ream.
2 reams = 1 bundle.
5 bundles = 1 bale.

A Sheet of Paper Folded Into:

2 leaves, forms a *folio;*
4 leaves, forms a *quarto,* **or 4to;**
8 leaves, forms an *octavo,* **or 8vo;**
12 leaves, forms a *duodecimo,* **or 12mo;**
18 leaves, forms an 18mo;
24 leaves, forms a 24mo.

Relevant Notes: The great gross and score are but seldom used. For convenience in counting, 500 sheets of paper are now commonly called a ream.

Money Tables.

United States Table

10 mills = 1 cent ($0.01)
10 cents = 1 dime ($0.10)
10 dimes = 1 dollar ($1.00)
10 dollars = 1 eagle ($10.00)

The coins of the U. S. are as follows:

Gold: the quarter-eagle ($2.50), the half eagle ($5.00), the eagle ($10.00) and the double-eagle ($20.00).

Silver: the dime (10¢), the quarter-dollar (25¢), the half-dollar (50¢) and the dollar ($1.00).

Nickel: the five-cent piece (5¢).

Bronze: the cent (1¢).

Relevant Notes: In ordinary business transactions the only terms employed are dollars and cents. The five-cent coin is called a "nickel"; the twenty-five cent coin a "quarter" (in some circles, "two-bits") and the fifty-cent coin a "half".

Paper Money. Notes of National Banks, of the U. S. Treasury, and of the Federal Reserve System, including gold and silver certificates, are largely used in lieu of coins. These notes are commonly alluded to as "bills" and are issued in denominations of one, two, five, ten, twenty, one hundred, five hundred, one thousand, five thousand and ten thousand dollars.

English Money.

English Table

4 farthings = 1 penny (d.)
12 pence = 1 shilling (s.)
20 shillings = 1 pound (L.)

Relevant Notes:

1 florin = 2 shillings
1 crown = 5 shillings
1 guinea = 21 shillings
1 sovereign = 20 shillings.
(*a coin*)

In English slang the shilling is a "bob" and the sovereign a "quid."

Basically, the monetary system of our neighbor Canada (part of the British Empire) is the same as that of the United States.

French Money.

French Table

100 centimes (c) = 1 franc (f)

Relevant Notes: The gold hundred franc piece is called a "Napoleon." At normal rate of exchange the franc equals 19.3 cents in U. S. money.

Foreign Currency. The following table exhibits the monetary unit and value in U. S. money of Foreign Currency, as proclaimed by the Secretary of the Treasury, as of October 1, 1926.

Country	*Monetary Unit*	*Value in U. S. Money*
Argentine Republic	Peso	$ 0.9648
Austria	Schilling	0.1407
Belgium	Franc	0.1930
Bolivia	Boliviano	0.3893
Brazil	Milreis	0.5462
British Colonies in Australasia and Africa	Pound sterling	4.8665
British Honduras	Dollar	1.0000
Bulgaria	Leva	0.1930
Canada	Dollar	1.0000
Chile	Peso	0.2017
China	Tael	0.8574
Columbia	Peso	0.9733
Costa Rica	Colon	0.4653
Cuba	Peso	1.0000
Czecho-Slovakia	Krone	0.2026
Denmark	Krone	0.2680
Dominican Republic	Dollar	1.0000
Ecuador	Sucre	0.4867
Egypt	Pound (100 piasters)	4.9431
Esthonia	Kroon	0.2680
Finland	Markka	0.0252
France	Franc	0.1930
Germany	Reichsmark	0.2382
Great Britain	Pound sterling	4.8665
Greece	Drachma	0.1930
Guatemala	Quetzal	1.0000
Hayti	Gourde	0.2000
Honduras	Peso	0.4582
Hungary	Pengo	0.1749
India (British)	Sovereign	4.8665
Indo-China	Piaster	0.4949
Italy	Lira	0.1930
Japan	Yen	0.4985
Jugo-Slavia	Dinar	0.1930
Latvia	Lat.	0.1930
Liberia	Dollar	1.0000
Lithuania	Litas	0.1000
Mexico	Peso	0.4985

Country	*Monetary Unit*	*Value in U. S. Money*
Netherlands	Guilder (florin)	0.4020
Newfoundland	Dollar	1.0000
Nicaragua	Cordoba	1.0000
Norway	Krone	0.2680
Panama	Balboa	1.0000
Paraguay	Peso (Argentine)	0.9648
Persia	Kran	0.0844
Peru	Libra	4.8665
Philippine Islands	Peso	0.5000
Poland	Zloty	0.1930
Portugal	Escudo	1.0805
Roumania	Leu	0.1930
Russia	Ruble	0.5146
Salvador	Colon	0.5000
Siam	Tical	0.3709
Spain	Peseta	0.1930
Straits Settlements	Dollar	0.5678
Sweden	Krona	0.2680
Switzerland	Franc	0.1930
Turkey	Piaster	0.0440
Uruguay	Peso	1.0342
Venezuela	Bolivar	0.1930

The Metric System. This system is used exclusively in several foreign countries. In the United States it is employed in the sciences generally, and by the Army in its prescription work. Based upon a decimal division (by tens) it approximates our system of coin denomination. It belongs to the Arabic System of numerical notation. It serves as a world-wide basis for reporting accurate scientific measurements. Its decimal scale makes a much simpler system of measurement than ours.

The *meter* is the unit of length.
The *liter* is the unit of capacity.
The *gram* is the unit of weight.

Subdivisions of the principal units are expressed by writing before the name of the unit the Latin prefixes:

Milli, to denote *one-thousandth* of the unit;
Centi, to denote *one-hundredth* of the unit;
Deci, to denote *one-tenth* of the unit.

Multiples of the principal units are expressed by writing before the name of the unit the Greek prefixes:

Deka, to denote *ten* times the unit;
Hekto, to denote *one hundred* times the unit;
Kilo, to denote *one thousand* times the unit;
Myria, to denote *ten thousand* times the unit.

Measures of Length. The principal unit of length is the *Meter;* it is approximately equal to one ten-millionth part of the distance, measured on a meridian, from the equator to the pole.

Table

10 millimeters = 1 centimeter
10 centimeters = 1 decimeter
10 decimeters = 1 meter
10 meters = 1 dekameter
10 dekameters = 1 hektometer
10 hektometers = 1 kilometer
10 kilometers = 1 myriameter

Relevant Notes. *The millimeter* and *centimeter* are used for very small measurements in the arts and sciences; the *meter,* in measuring cloth, short distances, etc.; the *kilometer,* in measuring long distances.

Measures of Area. The principal unit of area or surface is the *Square Meter;* that is, the area of a square whose side is one meter.

Table

100 square millimeters = 1 square centimeter
100 square centimeters = 1 square decimeter
100 square decimeters = 1 square meter
100 square meters = 1 square dekameter
100 square dekameters = 1 square hektometer
100 square hektometers = 1 square kilometer

Relevant Notes. The following terms are also used:
A centar = a square meter.
An ar = a square dekameter, or 100 centars.
A hektar = a square hektometer, or 100 ars. (About 2½ acres).

The *square meter* is used in measuring ordinary surfaces; the *square kilometer,* in measuring the areas of countries; the *ar* and *hektar,* in measuring parcels of land.

Measures of Volume. The principal unit of volume is the *Cubic Meter;* that is, the volume of a cube whose edge is one meter.

Table

1000 cubic millimeters = 1 cubic centimeter
1000 cubic centimeters = 1 cubic decimeter
1000 cubic decimeters = 1 cubic meter

Relevant Notes. The following terms are also used:
A decister = 0.1 cubic meter
A ster = 1. cubic meter, or 10 decisters

The *cubic meter* is used in measuring ordinary solids; the *ster*, in measuring wood.

Measures of Capacity. The principal unit of capacity is the *Liter*, which is equal to a cubic decimeter.

Table

10 milliliters = 1 centiliter.
10 centiliters = 1 deciliter.
10 deciliters = 1 liter.
10 liters = 1 dekaliter.
10 dekaliters = 1 hektoliter.
10 hektoliters = 1 kiloliter.

Relevant Notes: The liter is used in measuring liquids and small fruit; the hektoliter, in measuring grain, vegetables, and liquids in casks.

Measures of Weight. The principal unit of weight is the *Gram;* that is, the weight of a cubic centimeter (milliliter) of distilled water at its greatest density (39.2° Fahrenheit).

Table

10 milligrams = 1 centigram.
10 centigrams = 1 decigram.
10 decigrams = 1 gram.
10 grams = 1 dekagram.
10 dekagrams = 1 hektogram.
10 hektograms = 1 kilogram.
10 kilograms = 1 myriagram.
10 myriagrams = 1 quintal.
10 quintals = 1 metric ton.

Relevant Notes. The *quintal* is seldom used.

The *gram* is used in weighing letters, precious metals, and jewels, and in compounding medical prescriptions; the *kilogram,* in weighing ordinary articles; the *metric ton,* in weighing heavy articles.

A kilogram is the weight of a cubic decimeter (liter), and a metric ton of a cubic meter (kiloliter), of distilled water at its greatest density.

A kilogram is approximately 2 1/5 pounds avoirdupois.

Metric System Equivalents.

Length

Meter	= 39.37 in.	Inch	= 0.0254 m.
"	= 3.281 ft.	Foot	= 0.3048 m.
"	= 1.093 yd.	Yard	= 0.9144 m.
"	= 1.1 yd. (about)	"	= 0.9 m. (about)
Millimeter	= 0.039 in.	Inch	= 25.400 mm.

Centimeter	= 0.3937 in.	Inch	= 2.540 cm.
Kilometer	= 0.62137 mi.	Mile	= 1.60935 km.
"	= 3/5 mi. (about)	"	= 1.6 km. (about)

Area

Sq. meter	= 10.764 sq. ft.	Sq. foot	= 0.0929 sq. m.
"	= 1.1960 sq. yd.	Sq. yard	= 0.8361 sq. m.
Hektare	= 2.471 A.	Acre	= 0.4047 ha.
"	= about 2½ A.	"	= 2/5 ha. (about)
Sq. kilometer	= 0.3861 sq. mi.	Sq. mile	= 2.59 sq. km.

Volume

Cu. centimeter	= 0.061 cu. in.	Cu. inch	= 16.3872 cu. cm.
Cu. meter	= 35.314 cu. ft.	Cu. foot	= 0.0283 cu. m.
"	= 1.3079 cu. yd.	Cu. yard	= 0.7646 cu. m.
Ster	= 0.2759 cd.	Cord	= 3.6345 st.

Capacity

Liter	= 1.05668 liq. qt.	Liq. quart	= 0.94636 l.
"	= 0.9081 dry qt.	Dry quart	= 1.1012 l.
"	= 0.26417 gal.	Gallon	= 3.78543 l.
"	= 0.11351 pk.	Peck	= 8.80982 l.
Hektoliter	= 2.83774 bu.	Bushel	= 0.35239 hl.

Weight

Gram	= 15.4324 gr.	Grain	= 0.0648 g.
"	= 15½ gr. (about)	"	= 3/50 g. (about)
"	= 0.03527 oz. av.	Ounce av.	= 28.3495 g.
Kilogram	= 2.20462 lb. av.	Pound av.	= 0.45359 kg.
"	= 2 1/5 lb. (about)	"	= 0.00045 t.
Met. ton	= 2204.62 lb. av.	Short ton	= 0.90717 t.

Computation Formulas. Only a few of those most commonly used are here given.

To find the *area* of a parallelogram, rectangle, or square: Multiply the length by the width.

Thus if the sides are a and b we have the formula:

$$A = a \times b$$

To find the *area* of a triangle: Multiply the base by the height (altitude), and divide the product by two.

Thus if the base is b and the height h we have the formula:

$$A = \frac{b \times h}{2}$$

To find the *area* of a circle: *square* the diameter and multiply the product by .7854; or *square* the radius and multiply the product by 3.1416.

Thus if the diameter is d and radius r we have the formula:

$$A = d^2 \times .7854, \text{ or } r^2 \times 3.1416.$$

To find the *volume* of a cube (or room):

Multiply the length, by the width, by the height.

Thus if the length is l, the width w, and the height h we have the formula:

$$V = l \times w \times h.$$

To find the *volume* of a cylinder: Multiply the *area* of its base by its height (altitude).

Thus if the radius of its base is r and the height is h we have the formula:

$$V = r^2 \times 3.1416 \times h.$$

To find the *volume* of a cone or pyramid: Multiply the *area* of its base by one-third its perpendicular height (altitude).

Thus if the area of the base is a, and the height is h we have the formula:

$$V = \frac{a \times h}{3}$$

To find the *circumference* of a circle: Multiply the diameter by 3.1416. Thus if the diameter is d we have the formula:

$$C = d \times 3.1416, \text{ or, taking the radius, } r,$$
$$C = r \times 2 \times 3.1416.$$

Computation of Army Vital Statistics. To obtain an annual admission, death, or discharge rate, divide the aggregate number of cases for the year by the average of the daily strengths. If the number of cases is for less than one year's time, multiply them by the fraction of a year which they represent.

Calculation of Annual Admission Rate per 1,000: *Rule*—Multiply the number of cases admitted during a given week by 365 ÷ 7; multiply the result by 1,000, and then divide the product by the average strength of the command.

Example: During a given week two cases of measles occurred in a command whose average strength during the week was 500. What is the admission rate for measles for the week, expressed in terms of the Annual Admission Rate per 1,000?

Apply the rule:

$$2 \times \frac{365}{7} = 104.29 \quad 104.29 \times 1{,}000 = \frac{104290}{500} = 208.58$$

208.58 = Annual Admission Rate per 1,000.

Calculation of Monthly Non-effective Rate per 1,000: *Rule:* Divide the number of days lost during the month by the number of days in the month; to obtain the average daily loss divide 1,000 by the average strength of the command and multiply the result by the average daily loss.

Example: During a given month there were 200 days lost from sickness in a command whose average strength was 400. What is the mean non-effective rate per 1000 for the month?

Apply the rule:

$$\frac{200}{30} = 6.6 \quad \frac{1000}{400} \times 6.6 = \frac{6600}{400} = 16.5$$

16.5 = Monthly Non-effective Rate per 1,000.

CHAPTER XXIII

CARE AND OPERATION OF MOTOR VEHICLES

Introduction. Motor ambulances, trucks and motorcycles are utilized by the Medical Department in its various formations and establishments. To be an efficient operator, practical experience and knowledge are necessary. Books and theoretical lectures are helpful, but actual work on, and operation of a vehicle by the operator himself, are essential. Below no attempt has been made to discuss the technical composition and repair of motor vehicles. There are given only those rules and principles that all operators should know. The terms driver, operator, or chauffeur may be used interchangeably, as they have the same meaning.

General Rules. The following rules are observed in the operation of motor vehicles in highway transportation:

Military or civil police, on duty, must be strictly obeyed, and State and local highway traffic regulations carefully observed.

Drivers, while on duty, must not leave the vicinity of their vehicles until the trip has been completed or the vehicles have been properly parked. In case of mechanical trouble, or accident rendering a vehicle inoperative, every precaution must be taken by the driver to prevent other accidents or further damage or loss incidental thereto, or in conjunction therewith.

A broken-down vehicle must not be left in the middle of the road.

Drivers must report to their commanding officers, as early as practicable, any vehicles left by the roadside due to accident, mechanical trouble, or other causes.

Gasoline tanks must not be filled nor will work be performed on the carburetor or fuel system in the presence of a naked flame or oil lantern. If this work be done in the dark, an electric torch should be used. Each operator of a motor vehicle should invariably upon starting on a trip that may involve night driving check his equipment to assure himself that an electric torch, in good working order, is included.

Smoking, while driving, is not permitted.

Drivers must endeavor to prevent traffic blocks.

Traffic Regulations. Drivers must keep to the side of the road as provided for by local custom or regulation, whether moving or at a halt.

When about to stop or change direction, appropriate hand signals must be given.

The use of the muffler cut-out is forbidden at all times.

Careful attention must be given to road signs and to convoy signals.

Proceeding in a direction opposite to that prescribed for traffic circulation is prohibited.

Give way promptly to faster moving vehicles.

On dry, dusty roads reduce speed in order to keep down dust. Reducing speed also reduces liability to accident, especially at night.

Loaded trucks have the right of way over empty convoys, other considerations being equal.

In the theater of operations, when lights are not permitted, drive slowly.

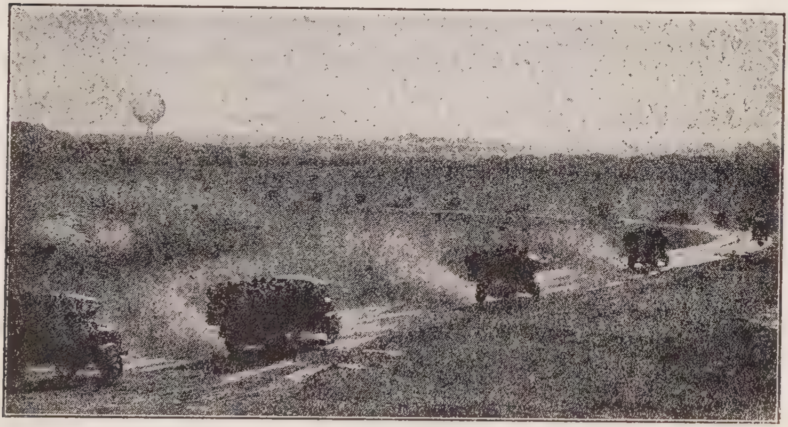


Fig. 176.—A Convoy of Motor Trucks Enroute.

When driving with lights and a car or convoy approaches, dim the lights to avoid accidents.

Adjust all vehicle lights while in town and cities, according to local regulations.

In descending a steep hill use the engine as a brake by shifting to a lower gear.

Do not pass a halted convoy without first obtaining permission from its commanding officer and ascertaining that the doubling can be accomplished without confusion.

Do not make unnecessary noise with horns or warning signals.

Doubling. Observe the following rules for "doubling," i. e., passing traffic moving in the same direction:

In passing vehicles traveling in the same direction, always pass on the side prescribed by local regulations, and sound horn.

In passing a standing or moving convoy, slow down and sound horn.

A vehicle must never double moving vehicles of higher normal speed.

Examples: A tractor must not double a truck, and a truck must not double a passenger car.

Vehicles must never attempt to double when there is a traffic block ahead.

Never double in towns or villages, if it blocks or interferes with the normal flow of traffic.

Never double while descending steep hills, at street intersections, or at crossroads.

Never double just before reaching the top of a hill.

Do not double unless the road is wide enough to allow at least 18 inches between vehicles.

In doubling, do not make sharp angles before or after passing the vehicle in front.

Meeting Vehicles. In meeting vehicles coming in the opposite direction, observe the following rules:

Pass an approaching vehicle on the side provided for by local custom and regulation, and give it half the road.

Slow down at crossroads unless the road can be seen in each direction across the road.

Slow down to half speed if the road is narrow or rough.

In case of traffic or other obstacle at the point where two vehicles will meet, the vehicle having the clear road ahead has the right of way, and the other vehicle must slow down or stop if necessary.

Slow down at crossings unless the road can be seen in each direction for at least 75 yards.

Crossing Railroads. In crossing railroads—

Slow down.

If the gates are closed, do not start before they are open.

In case the road passes under the railroad, make sure there is adequate clearance between the top of the vehicle and the bridge.

Halting. With reference to halting, observe the following rules:

If it is necessary to stop on a hill, put a chock under a rear wheel; but before proceeding always remove the chock from the highway.

Motors must not be kept running to exceed one minute when vehicle is halted.

Examine amount of water, gas, and oil during each long stop.

Vehicles should not be halted on bridges, in narrow roads, or defiles, or on turns. If necessary to be halted when approaching a crossroad, road forks, or railroad, they must be halted before coming within 50 yards thereof.

Investigate and find cause of all unusual noises in the vehicle.

Should a vehicle be unable to proceed under its own power, the next one in the rear must pull forward and give assistance.

Drivers, when dismounted, must keep off the center and opposite side of the road.

Speed Limits. Except in cases of emergency, the following are the authorized maximum speeds for motor vehicles.

Vehicle	In towns (miles per hour)	Outside of towns (miles per hour)
Trucks, type 2 (class AA)	12	20
Trucks, type 3 (class A)	12	15
Trucks, types 4 and 5 (class B)	8	14
Trucks, [illegible] (class C)	12	25
Light delivery vehicle (3/4-ton capacity or less)	15	30
Ambulances	15	25
Passenger cars, small and large	15	35
Motorcycles, without side cars	18	35
Motorcycles, with side cars	18	30

Speed plates are stenciled accordingly and placed in each motor vehicle. In establishing these speed limits, consideration has been given to trucks equipped with pneumatic tires. State and local ordinances governing speeds of motor vehicles must not be exceeded on public highways.

The Chauffeur (Driver, Operator). The chauffeur is permanently assigned to a vehicle and is responsible for it and its equipment. He should be instructed in the nomenclature of the various important parts or assemblies of his vehicle.

He is responsible for its appearance, cleanliness, and lubrication. He must always be neat in appearance. He should be carefully instructed in the rules and regulations affecting the operation of his vehicle, particularly those pertaining to the authorized speeds and loads, and familiar with general traffic rules and the local traffic regulations of the state and city where he is stationed.

He must drive so as to effect the utmost economy in fuel, tires and brakes.

Before leaving on a trip he should see to it that the radiator, gasoline tank and oil reservoir of his vehicle are filled, that he has a serviceable spare tire and proper tools for emergencies, and that the speedometer is working.

In this connection, he can save himself much trouble by bringing to mind the word "aglow" and quickly checking over a motorist's application of the letters in that word, viz.: "a" for air (tires), "g" for gas, "l" for lights (are they working?), "o" for oil (not only in motor, but lubrication), "w" for water (battery included), —air—gas—lights—oil—water

Special Instructions for Operator. The motor should never be raced when vehicle is standing. If, for any reason, the motor is idled, gas and spark controls should be retarded. When vehicles that require cranking are started see that the spark is retarded, gear lever in neutral, and brakes set before cranking the motor. In starting vehicles that have starting motors, the spark lever should be set from two-thirds to three-fourths full-advanced position in ordinary weather, and in cold weather fully advanced for starting.

The *clutch* should always be engaged slowly and without jerk, in order that the vehicle will start or stop gradually. The vehicle should never be stopped abruptly, except to avoid accident. The engine speed should be reduced as much as possible by closing the throttle and disengaging the clutch and the vehicle brought to a stop by gradual application of the brakes. In descending hills the brakes should be assisted by shifting gears into second speed, engaging clutch, closing throttle and shutting off the ignition, and allowing the engine to be turned over by the coasting of the vehicle; in descending very steep hills the gear should be shifted into the low speed.

Particular attention should be paid to the *alignment of the front wheels,* and in case any undue wear on the tread of the tire is noticed the fact should be immediately reported in order that front wheels may be properly trued up.

Never drive with foot on the clutch pedal. Do not drive the vehicle with retarded spark. In case the motor labors, change gear to meet road requirements. If vehicle is equipped with a cutout this must under no circumstances be used when driving.

Skid chains are part of the vehicle's equipment and should be ready at all times for use when necessary. In case the vehicle is to be used at night, lamps must be tested before dark to see that they are in working order.

Operators before slowing up or stopping should signal to those behind, according to local traffic regulations. Before backing up, operators must be certain that the road is clear.

In general, fire apparatus and ambulances have the right of way at all times. On the approach of fire apparatus, operator should immediately draw his vehicle as close to the right-hand side of the road or curb as possible, and parallel thereto, bringing it to a stop.

Vehicles must not be parked on any street or highway so as to interfere with the passage of pedestrians.

The Motorcyclist. Contrary to the usual belief that any man can operate a motorcycle with a few minutes' instruction, experience has taught that a motorcycle operator must have more practical training than the operator of any other motorized vehicle.

The modern motorcycle of American manufacture is equipped with a very powerful motor, which responds quickly to the throttle and accelerates rapidly. The solo mount is heavy and under certain conditions is difficult to keep from falling. The side car, unless properly handled by an experienced operator, is a dangerous vehicle to both operator and passenger. Training of operators should therefore stress operation under all kinds of traffic conditions, in order that practical experience and knowledge may be gained.

The operator should have a thorough knowledge of the mechanical construction of his machine, so that he may form a mental picture of what takes place under certain conditions, i. e., when he disengages his clutch and shifts gears he should know just what is taking place in the gear box and how the clutch operates in relation to the gears.

Road troubles to motorcyles usually consist of punctures, loose or broken chains, and bearings out of adjustment. An ordinary puncture may be repaired without removing the wheel by breaking off one side of a small section of the tire from the rim, exposing the tube, carefully cleaning the same with gasoline, and applying a cold patch. In replacing the tube and casing care should be taken that the tube is not pinched by the casing and the rim.

Side-car Driving. This must be learned by actual experience. In training inexperienced operators the ground selected for training should be smooth and unobstructed by trees, fences, posts, or traffic to enable the operator to gain confidence and to devote his entire time to the details of operating the machine. Much attention should be devoted to turns similar to those that will be encountered in road work. The operator should be required to circle certain fixed objects within a given area. He should devote considerable time to making right-hand turns up to and including 90°. This is the dangerous turn for an inexperienced operator.

More serious accidents have been caused by the inability of the operator to negotiate the turn to the right than for any other reason. The principle involved is as follows: That on a straightaway the motorcycle proper furnishes the tractive power, and while that power is applied the tendency is for the motorcycle to run ahead of the side car. When that power is shut off, then the conditions are reversed; the side car being light there is a tendency for it to push ahead and crowd the motorcycle off to the left of the road. Therefore, it can be readily seen that to overcome this condition it is merely necessary to open the throttle so that the motorcyle is pulling again, and this will tend to straighten up and bring the machine back to the center or to the right of the road without danger of capsizing. There is a mental condition of the operator which will have to be overcome; that is, as soon as he realizes that his motorcycle is gradually working toward the left side of the road, his first impulse is to shut off the power, throw in his clutch and apply his brakes. This should not be done, especially if he is traveling at a rate of 25 miles per hour or faster. In order to overcome this mental condition, experience alone will teach the student and, as stated above, this is one of the things that he can not and will not learn out of a book.

Special attention should be given to the air pressure in tires. This varies with conditions, and no attempt is made here to advise the amount of air to be used, except that it is usually the practice to inflate the rear tire of the motorcycle with about 10 pounds more pressure than that given the front tire —this for ordinary road work.

A motorcyclist must be intelligent; he must be able to think and act quickly, and also must be of the type who will look after his machine with regularity and frequency, having in mind that a motorcycle is a high-speed, air-cooled engine, develops considerable horsepower for the bore and stroke, and that there is a tremendous vibration, which tends to loosen nuts, bolts, screws, etc., which must receive constant attention.

Safety Rules for Drivers. Summed up below are certain sensible rules now being nationally recognized, which, if read over from time to time, memorized, and carefully observed, will save an operator much "trouble."

Brakes and Braking. Brakes should be tested daily. Make a test by disengaging the clutch and applying the brakes.

Motor vehicle brakes have a definite relation to safety.

Make sure that brake lining is properly installed.

Keep the brakes in good operating condition.

Once in two months remove the rear wheels and wash the brake lining in kerosene. This removes all oil and grease which, if present, take the "bite" out of the brakes. Never oil brake lining.

Brakes squeal when they are glazed or when improperly adjusted. Squealing can often be stopped by removing wheels and roughening the brake lining with a file.

If the brake lining is worn down to the rivets, sink the rivets still farther or have the brakes relined.

Wipe off and oil the brake mechanism every 500 miles, or at least once a month.

Make regular systematic brake inspection a habit. The loss of a cotter pin might lead to a serious accident. When a lock washer is removed, don't put it back; use a new one.

More accidents result from faulty adjustment or application of brakes than from any other cause. All drivers should keep the brakes adjusted properly. Brakes should not drag; if they do they will heat up and be worn down unnecessarily. Brakes should not be too loose; loose brakes do not act quickly enough. Different adjustments are made for different types of brakes.

After the brakes are adjusted they should be tested every 1,000 miles, or at least once a month, to make sure that the braking power is equally divided between the two rear wheels. Many vehicles skid, not only because of slippery streets, but also because of unequal division of braking power. Jack up rear wheels and apply brake far enough so that it is just possible to turn one wheel by hand. Adjust brake on other wheel so the same amount of energy is required to turn that wheel by hand.

Apply brakes properly when on the road.

When coming to a stop on a straightaway, shut off the gasoline throttle and leave the clutch engaged until just before you come to a stop; this method of stopping is especially advisable in wet weather because it lessens the tendency of the car to skid. It also helps to distribute the braking power equally, and assists the action of the brakes. Do not shut off the ignition until after you have stopped; it may be necessary to make a quick start. Find out the idling speed maintained by your car when the gasoline throttle is closed, then never (except in emergency cases) try to use your brakes when the clutch is engaged and the vehicle is traveling slower than the idling speed.

When going down an ordinary hill, leave the clutch engaged and close the gasoline throttle. This helps cool the engine and also makes it unnecessary to use the brakes. It is sometimes desirable to turn off the ignition switch; this further cools the engine and adds to the braking power.

In going down steep hills or when descending ordinary hills with a heavy load, put the gears in intermediate or low speed at the top of the hill and leave the clutch engaged. Shut off the gasoline throttle and, if desirable, turn off the ignition switch.

In ordinary driving, do not use the brakes oftener than necessary; regulate the speed of the car as much as possible by use of the throttle. If the car is equipped with a foot throttle use it in preference to the hand throttle. This leaves the hands freer to operate the gears and the steering wheel.

In making an emergency stop, leave the clutch engaged, apply the foot brake, and pull the hand brake; but do not "lock the wheels." Keep the wheels rolling; otherwise there is danger that the vehicle might slide or skid.

Rules of the Road. Almost every State and community has its own traffic laws, and drivers should be thoroughly familiar with all laws that apply in the locations where they have occasion to drive. A copy of the State laws can usually be secured by addressing the secretary of the state at the State capitol; local ordinances from the local police department.

There are, however, many laws that are universal enough to be called common "courtesies" or rules of the road.

Every driver should extend the same courtesies to "the other fellow" that he expects the other fellow to extend to him.

Every driver, of course, knows that he should pass to the right when meeting other vehicles going in the opposite direction. Slow-moving vehicles should keep to the extreme right.

Always sound the horn and pass on the left when passing other vehicles going in the same direction. This applies when passing all vehicles except street cars and vehicles traveling in the street-car tracks. When at street intersections, on curves, or when going up or down a hill, never pass another vehicle going in the same direction.

At street intersections give the right of way to the car at your right. Do not presume too much when you have the right of way; perhaps the other fellow doesn't know it.

When stopping or parking a car, see that the right side (not the left side) is toward the curb. The wheels should be cramped to the right so the vehicle can not move far accidentally. Make sure that the emergency brake is on and that the gears are in neutral before leaving the vehicle. Do not stop car within 15 feet of a fire hydrant.

Always signal when you expect to stop, start, or turn.

Always sound horn three times before backing.

It is a gentlemanly act as well as a safety precaution to dim your headlights when approaching another vehicle in the dark.

Motor Vehicles and Pedestrians. No laws prohibit pedestrians from using the streets. In fact, pedestrians have equal rights on the streets with motor and other vehicles. Just because some pedestrians use the streets needlessly and incautiously, there is no excuse for the drivers of motor vehicles not taking every precaution to avoid injuring pedestrians. Pedestrians outnumber drivers. Drivers can think of many laws that if enacted and enforced could limit the movement of the pedestrian but until such laws are passed we must remember that the law is usually on the side of the pedestrian.

Motor vehicle drivers must be especially careful to avoid injuring pedestrians who cross the street at the middle of the block.

Many accidents happen at regular crossings. If pedestrians do not or will not pay attention to your horn, remember that some people are deaf, while others are mentally deficient, and that hundreds of people are using the streets whose old age, youth, infirmities, and physical defects would throw all the responsibility of an accident upon you.

Be especially careful when two or more people are crossing the street together. Quite often, before an approaching automobile, one person may stop, or they may separate and go in opposite directions.

Above all, do not unnecessarily or suddenly blow your horn. Pedestrians may be easily frightened and temporarily paralyzed.

Drivers should stop 10 feet behind street cars which have stopped to load or unload passengers. In some cities where there are safety zones motor vehicles are permitted to pass standing vehicles if they do so slowly and at least 8 feet from the side of the car.

People who have just alighted from a trolly car are sometimes bewildered and do not know which way to go. Give them plenty of time to get their bearings before attempting to pass them.

Regardless of who you think is at fault, if your vehicle injures or kills some other person, you are usually held responsible.

Hazards of the Street. Street conditions often affect safe and efficient operation of motor vehicles. Generally speaking, wide streets are safer than narrow streets; they offer greater space in which drivers can operate in their endeavors to avoid running into persons, objects, and other vehicles.

Asphalt, brick, wood-block, macadam, sandy, clay, and dirt streets each have different characteristics that may affect safe driving; rain and snow make still further changes in the character of the street.

Wood swells when wet. Wood-block streets should therefore be watched carefully; the uneven swelling of blocks may result in dangerous bumps and holes.

Moisture forms a thin film over wood blocks and makes them unusually slippery.

Brick streets are liable to become wavy; it is best to drive slowly on wavy streets.

Learn to respect sand roads. If you expect to turn out for any reason, start a considerable distance back of the point where you wish to be out of the road.

Even a slight amount of moisture makes clay roads dangerously slippery.

Loose dirt may hide dangerous holes, or cause skidding on macadam and dirt roads.

Drivers should avoid the busiest streets whenever possible.

Car tracks on a street add considerably to the hazard.

If possible, travel streets that do not have car tracks.

Never travel with wheels in car tracks. It wears tires unnecessarily, and tracks may cause driver to lose control of car. Rails are especially slippery when wet.

Travel boulevards where possible. Ordinary streets present many things that confuse the mind of the average driver; street cars, continual stopping and starting of other automobiles, slow-moving vehicles, etc.

Excessive dust is dangerous. Dust particles or small insects in a driver's eye may temporarily blind him and an accident may result. Proper adjustment of the windshield or the use of goggles may help. If possible avoid dusty thoroughfares.

Slow up and do not pass at curves or street intersections other vehicles going in the same direction. Be careful at blind corners, even though you have the right of way.

Determine just what your brakes will do when driving on different kinds of roads under different weather conditions, and be careful accordingly.

Drivers should appreciate the hazards resulting from these conditions and govern themselves accordingly.

Motor Vehicles and Railroads. It is advisable never to cross a railroad track in high gear. Many accidents happen because cars become stalled while on the track. It is safer to shift into intermediate or low gear a reasonable distance before crossing a track.

All crossings should be considered as dangerous, whether guarded or not; crossing bells are sometimes out of order; watchmen or gate operators may be off duty.

Be especially careful at crossings where there is more than one track. Do not cross directly behind a train that has just gone by; another train may be coming in the opposite direction on the next track.

A train running 40 miles an hour goes 59 feet in 1 second and can not be stopped in less than about ¼ of a mile. An automobile running 25 miles an hour can be stopped in 58 feet. Which should stop, look, and listen at railroad crossings, the train, or the automobile?

Accidents involving railroad trains and automobiles rarely ever kill or injure any one on the trains—it is usually the people in the automobiles who are killed or injured.

Motor Vehicles and Electric Railways. It is dangerous to follow too closely behind a moving street car. If the car stops suddenly the vehicle driver (especially if he is riding the car rails) may find it impossible to avoid a collision. Or the car may turn at a street intersection and crowd you between the car and the curb. Then, too, a person may jump from the car directly in the path of your vehicle.

The driver should stop his vehicle not less than 10 feet back of a standing street car and remain there until the car starts up again. If there is a safety zone, drivers in some cities are allowed to pass the car provided they proceed cautiously and keep at least 8 feet from the side of the car.

.Some drivers take dangerous chances in crowding in between a trolley car and the curb, or between a car and another object where the clearance is too small.

Drivers should not attempt to pass on the left of a street car going in the same direction. A car may be coming in the opposite direction or pedestrians who were hidden by the car may be injured. Always sound horn when passing a car, no matter what its direction may be.

Automobiles have frequently been hit by the rear end of a car when the car was turning a corner. At turns the end of the car swings out and extends several feet beyond the tracks. Watch for curves.

Always remember that the street car runs on tracks and can not arbitrarily change its course. It is therefore the driver's responsibility to watch for cars rather than the motorman's to watch for automobiles.

Garage Accident Hazards. In spite of the great number of accidents which have resulted from gasoline explosions, drivers and garage workers continue to do things which endanger not only their own lives, but also the lives and property of others.

It seems needless to caution against the use of matches, cigars, cigarettes, and other open flames near gasoline, or near oil-soaked rags and clothing.

In drawing or pouring gasoline from one container to another, static electric sparks may be developed. It is advisable always to keep the two containers in contact with each other, or to attach a chain to the pouring container, which will maintain the contact. This will lead off the electric charge and prevent sparking.

Sparks often result from striking together two pieces of metal. It is best to use kerosene instead of gasoline when cleaning oil and grease from metal parts.

Every motor vehicle should carry a tetrachloride fire extinguisher. For garage use probably the best fire extinguisher is one of the foam type. Never use water on a gasoline or oil fire; it will spread the fire. A mixture of sawdust and soda (about 10 pounds of bicarbonate of soda to a bushel of sawdust) is good to put out oil fires. Sand is also used effectively.

The drip pan, side pans, and car in general should be kept clean and free from excessive oil. If present, excessive oil may do much to spread the flames in case of fire.

If extension cords are used for portable electric lights, it is necessary to guard against electric shock and fires resulting from electric causes. It is therefore advisable to use vapor-proof fittings, a keyless socket, lamp inclosed in a vapor-proof globe and further protected with a rigid cage to prevent breakage. It is also advisable to have armored cable instead of ordinary electric cord; this should be kept in good condition.

When it is necessary to jack up the car and get underneath, be sure the car is held up securely. Be especially careful if any of the wheels have been removed. Block the other wheels to keep them from moving. If the support should give way, the car may fall and crush you. It is best to use a pit, if possible. Never depend on jacks when it is necessary to get under car. Horses are better supports than jacks, ordinary boxes, or blocks. Remember, the brakes are not operative when the rear wheels are jacked up off the ground.

When in the garage, the engine should not be run longer than necessary. Carbon monoxide is contained in the exhaust gases, and unless the garage is fairly well ventilated may cause headaches, other discomforts, and even death to the persons in the garage.

If you haven't a self-starter, be careful not to break your arm when cranking.

Always pull the crank up, not down, and don't spin it unless absolutely necessary.

When grasping crank, place thumb on same side of handle with the fingers; then if there is a kick-back, handle will slip from hand.

Keep the spark retarded until the engine has started.

Be careful when working around or using rags near rotating fan.

Keep wrenches and other tools in good condition; if badly worn they should be replaced.

Don't drive too close to the gasoline pump at garage or filling stations, and always be sure to shut off the engine when the tank is being filled with gasoline.

Springs, Frame, Loading, and Tires. Broken springs and many serious accidents may be avoided by—

Keeping spring clips tight, using rebound clips, lubricating springs properly, proper loading, and careful driving, especially on rough roads.

The frame can be kept in good condition by—Frequent cleaning, this prevents rust; keeping all bolts tight; replacing all loose rivets, and proper maintenance and adjustment of all brace rods.

Loading. When loading—Avoid overloading one side, do not attempt to carry more than the rated capacity of the vehicle, do not pile too high; neither should the load be top-heavy. Load heavy articles on the bottom and light articles on top.

No part of the load should extend beyond the sides of the vehicle.

Neither should the load extend beyond the back of the vehicle. If pipes or other articles are loaded which must project beyond the end of the car, a bright red flag in daytime and a red light at night should be attached at the far end of the projection. Be especially careful when turning corners to make sure that you do not swing around and strike pedestrians, objects, or other vehicles with the projecting load.

Tires. Tires sometimes cause accidents.

A blow-out, especially when on a front wheel and when speeding, may overturn the car or result in some other serious accident.

It is dangerous to run a car with a soft tire, especially if the rims are of the quick detachable type. Soft tires, especially on front wheels, make steering difficult, consume extra power, and may accidentally be pulled off the car easier than if they were properly inflated. Throwing of tires is dangerous; if the car is traveling at high speed it may even cause the car to overturn.

If rims are of the split-rim type, lock rim properly before it is put on the wheel. Be sure wedges are screwed up tight.

Do not overinflate the tires. Air expands when heated. A tire which tests at 60 pounds in a garage may show over 70 pounds after the car has been driven at a good speed over a hot road.

If wire wheels are used, be sure they are securely locked, all spokes tight, and wheels running true.

Motor Vehicle Lights. Modern laws on this subject now require that from 30 minutes after sunset until 30 minutes before sunrise (1 hour in some States) no motor vehicle should be operated unless it has sufficient lights, so adjusted and operated as to render the highway safe for all the public.

The headlights should enable the driver to distinguish clearly a person, vehicle, or substantial object at least 200 feet ahead. Dangerous glare or dazzle should be avoided.

Cars should display—

Two headlights when in motion, one on each side, both lights of equal power. Headlights to be white or tinted; never red.

One or two headlights when standing still. Lights should be visible at a distance of at least 500 feet.

One tail light, red, that is visible at a distance of at least 500 feet. Light should be displayed whether car is in motion or standing. Tail light should be at left of center of car and illuminate number plate with a white light.

The bulb in some headlights can be moved slightly backward or forward by adjusting a small setscrew. To focus a bulb, allow light to shine on a wall 25 feet away. Move bulb backward and forward until the circle of light on wall is of smallest possible diameter. The majority of headlight devices call for this adjustment. A few call for an adjustment either behind or ahead of the focal center; correct adjustment for either position gives largest possible spot of light without a dark or shaded center.

Headlights should be tilted up or down as required by the different types of headlight devices. Car vibration easily changes the tilt and focal adjustments; frequent tests and readjustments are necessary.

Always carry a spare bulb for your headlights, the same as you do a spare tire.

Headlight lens may loosen and rotate in the frame; inspect it frequently; adjust and tighten it if necessary.

Spot light should be installed as high up on the car as practicable. It should be impossible to make the center of its beam of light strike the level highway more than 50 feet ahead of the car; except when swung 30° to right or left of straight-ahead position, then no limitation is placed on the height to which the beam ray may be raised.

Reflectors need careful attention.

Replace dented reflectors.

Replace or replate tarnished or rusted reflectors.

Finger prints mar surface of reflector; use soft cloth when handling.

When wiping reflector, use soft cloth and wipe from center outward to rim, not round and round.

If lens breaks, tie a paper or cloth over headlight until lens can be replaced.

Safe and Efficient Driving. An operator may have a mechanically perfect vehicle, but because of careless driving he may cause an accident that results in serious injury or death to himself or others.

Reckless driving is not a demonstration of skill.

A moment or two saved to-day by reckless speeding is not efficiency, for speeding to-morrow may result in a smash that will lay up the car for several days and you for several months. Hurrying to get ahead of a train, a street car, or another vehicle saves only a moment or two at the ultimate destination and the gain is not worth the price; there is too much danger of accident.

The best drivers are especially careful at dusk or twilight. There is then neither enough daylight nor sufficient artificial light to make objects distinguishable at ordinary distances.

Slow up for all turns in the road. Blind corners are dangerous. When it is impossible to see what is coming from around the corner, be prepared to stop. Sound horn a short distance before the corner.

Don't zig-zag from one side of the street to the other.

When installing chains on the rear wheels, install them on both wheels or none at all. Only one chain may result in a serious accident. Chains on all four wheels help the steering of the car.

There are ruts at the bottom of almost every hill. Hitting these ruts at too high a speed may cause the driver to lose control of his car.

Drive slowly on bridges and at culverts. A bad rut or a stone in the road may throw your car against the structure.

When attempting to pass another vehicle going in the same direction, start turning out (to the left) at least 75 feet to the rear. If you get up too close your view of the road ahead is obstructed and you may turn directly in front of another car coming toward you. When you have passed a car do not cut back into the road nor slow down too soon.

Clean windshields give you a clear view ahead. Every car should have a secondary windshield (rain visor) or windshield wiper which will prevent snow or rain from obstructing the driver's view.

When driving, do not attempt to carry on a conversation with others in the vehicle.

Be sure and signal when driving toward or away from the curb.

Convoy Principles. The efficiency of motor transport is dependent upon two factors:- first, the condition of the vehicles themselves; and, second, the training and discipline of the personnel operating them. If motor transport is to be efficient, both of these factors must be efficient, and if either the vehicle or the man is inefficient, the combination is bound to be.

Since the organization of motor transport is a matter of regulations and orders, and since a motor truck is incapable of independent action, it is obvious that all rules for promoting the efficiency of motor transportation apply only to the personnel; in other words, the human element is the predominating factor.

Unit Commander. To be an efficient commanding officer of a motorized unit requires not only the combination of personality, judgment, and tact necessary in a leader of men, but also a more than superficial knowledge of the general mechanical principles of the gasoline automobile, plus an appreciation of the limitations of both men and machines, individually or combined.

The unit commander is responsible for the discipline of the organization and the mechanical fitness of its vehicles. He can accomplish these ends only by making each man realize that he is an important cog in the military machine, that in time of war the work his vehicle does is just as essential in defeating an enemy as the rifle of an infantry soldier, and that for this reason he should be just as soldierly and must take just as good care of his vehicle as the infantry soldier takes of his rifle.

In formation on the road, perhaps the most important function of the unit commander is to prevent over speeding of trucks. Trucks are built for strength and not for speed, yet speeding is a most difficult practice to prevent, is very destructive of the truck mechanism, and very liable to cause accidents. Therefore, violations of speed regulations always call for prompt punishment. Frequent occurrence of accidents indicates poor discipline, and in order to keep the number down strict disciplinary measures must be taken with the drivers. The burden of proof of the unavoidability of any accident is always placed on the driver, and he will not be relieved of responsibility unless he proves beyond a reasonable doubt that the accident was not his fault. If a unit commander adopts the policy of never giving a driver the benefit of the doubt, accidents soon become of rare occurrence.

The unit commander also keeps an accurate check on gasoline and lubricating oil. It is a favorite practice to use gasoline for many things besides fuel. The gasoline supply is usually placed under the immediate supervision of one designated man, who keeps a record of all receipts and issues. Supervision of the care of tools is also an important function of the unit commander. Individual check of this equipment is made by the commander in person at frequent intervals to assure not only that the equipment is complete, but to detect carelessness or theft.

Whenever possible, one man is assigned to one vehicle and is made to feel that that vehicle is his job, but his job only so long as he makes good at it. It is the aim of each unit commander to make the driver's job so attractive that there will be some incentive for the man to hold it. At the same time, the driver is held by the unit commander strictly responsible for the continued efficient performance of his vehicle. It should be kept in perfect running condition at all times, clean, bright parts polished, tools and accessories serviceable and complete, and thoroughly lubricated. The unit commander takes no one's word for this, but sees to it himself.

No unauthorized use of motor transportation is tolerated. Summary punishment, immediate relief from duty, and financial responsibility for supplies used or damage resulting, follow each unauthorized use of a government vehicle. One unpunished "joy ride" does more harm to the morale of an organization than any other one thing.

Motor Convoys. Two or more vehicles operating together on the same road constitute a convoy, and when more than ten vehicles are in a convoy, they are divided into sections of not more than ten vehicles per section.

Each section is designated by means of a red disk, twelve inches in diameter, which projects upward from the rear of the left hand side of the last vehicle in each section. The last vehicle in the convoy carries two of these twelve-inch disks as rear markers. Where possible, in addition to the driver, each truck carries one assistant driver whose duty is to watch for all signals from ahead, to indicate them to the driver, and to pass them on to the vehicle following. The assistant driver also relieves the driver on long trips. Whenever possible, a noncommissioned officer is assigned to each section and he is designated as the Section Chief.

Section Chief. Each Section Chief is responsible for the discipline, instruction, and all other matters pertaining to the personnel of his section and for the operation, repair and upkeep of its equipment. He is the intermediary between the men of his section and the unit commander. He should assure himself that his section is in proper condition at all times by making regular and systematic inspections of his men and equipment; he should examine all of his vehicles on their return from work, and see that the drivers have taken the proper care of them and where necessary, that the proper repairs are made.

Mechanics. Whenever possible, a mechanic is assigned to each section of the convoy and the unit should have a chief mechanic who should exercise general supervision over not only the section mechanics but the individual drivers, in the adjustment and repair of their vehicles. If there is a chief mechanic, he is responsible for the repair and equipment pertaining to the organization. In the medical regiment each motorized company has a mechanic. He normally rides at the rear of the company.

Guide. On the road the Chief of each Section rides in the first vehicle of his section and his duty is to maintain discipline, to check speed, and to see that proper distances are maintained.

Either the senior noncommissioned officer or the officer commanding rides in the first vehicle of the first section. He acts as the guide of the convoy, is equipped with maps of the country traveled, and if possible he should be thoroughly acquainted beforehand with the route to be traversed. He is responsible for the maintenance of proper speed, and also that the rules of the road are observed.

Speed Limits. As each class of motor vehicle in the military service has a definite speed limit, and as damage is absolutely sure to follow when this speed limit is exceeded for any considerable time, the proper maintenance of convoy speed is one of the most important duties of a convoy commander. The speed limits prescribed by regulations are given above.

Doubling. No vehicle is permitted to double a vehicle of the same or a higher class of speed. By doubling is meant passing a vehicle when going in the same direction. Under certain circumstances, a fast pneumatic-tired truck, may be permitted to double a heavy, solid-tired cargo truck, but only when the proper authority has been granted.

Road Rules. The general rules of the road are set forth above, but those to be observed by motor convoys may vary somewhat depending upon the locality in which the convoy is operating. It is, therefore, the duty of a convoy commander to ascertain just what general and special traffic laws are enforced in the community and to see that the convoy adheres to them at all times.

In going through a large city, time will frequently be saved if a scout is sent ahead to locate a route, especially where one way traffic streets are apt to confuse a strange driver.

In general, the convoy keeps to the right of the center of the road and pulls clear off the road, to the right, before halting.

On meeting vehicles at night, or in towns and cities, lights should be dimmed, and the usual courteous conduct required of the present day motorist should be carefully observed.

A halted convoy should never be passed without permission from its commanding officer, after making sure that the doubling can be accomplished without confusion. Good sense prescribes that doubling should not be permitted when going around sharp curves, when approaching a bridge, at the top of a hill, when there is a block ahead, when descending a steep hill, on a narrow road, or in the heavy traffic of towns. Much of course depends on the judgment of the commanding officer. It is better to take a chance on being a trifle late than to take unnecessary chances on the road in the attempt to gain time.

Where distances are properly maintained and speed carefully watched there is little chance for vehicles to become strung out along the road, or to have serious accidents. If, however, distances are not maintained and each vehicle is allowed to proceed at its own speed, disaster is almost inevitable.

One of the most frequent mistakes made with motor convoys is the placing of the light fast transportation at the head of the column and setting the speed for it, permitting the heavier, slower moving vehicles at the rear of the line to string out for several miles. The convoy commander should, therefore, know just what each vehicle has to do and its ability to do it before determining its position in the convoy. If the convoy is expected to travel as a unit (and only in very exceptional circumstances should it do otherwise), it is best to put the heaviest truck, towing the heaviest trailer, at the head of the column and make the other vehicles hold down their speed and stay behind it, rather than to over-speed the heavy truck towing the heavy trailer in an attempt to keep up with the rest of the convoy.

Convoy Distances. The distances which must be maintained by vehicles of a convoy (Fig. 176) are:-

On the open road at average speed, 20 to 30 yards between vehicles, and 40 yards between sections;

Passing through villages and towns at the average speed, 10 yards between vehicles, and 25 yards between sections;

Halted, 5 yards between vehicles, and 20 yards between sections.

In ascending or descending a long, steep hill, the distance between vehicles should increase to 50 yards, and this is accomplished by speeding up the first vehicle of the convoy on approaching the hill, so the cars following can take the proper distance. Just as soon as level country is again reached, the leading vehicle in the convoy should slow down and wait for the others to come up to the proper distance before continuing at the authorized rate of speed.

Before entering a town or village, if the entire convoy is not at the proper distance, the leading vehicle should halt until the others catch up, so that the convoy may proceed through the town as a unit. Failure to observe this rule has frequently resulted in the loss of several vehicles on account of their taking the wrong turn, because the driver couldn't see the vehicle ahead. The few minutes' halt for the column to close up will thus frequently obviate several hour's delay in getting the convoy together again.

Signals. When the convoy lines up on the road ready to start, or when halting, all drivers and assistant drivers dismount at the right hand side and keep off the road.

When the commanding officer has satisfied himself that the convoy is ready to start, the signal for attention is given. This may be done with a whistle or with the hand. Several short blasts with the whistle, or the hand moved above the head quickly from side to side, or the verbal command "attention" bring the drivers on the seats behind the steering wheels and the assistant drivers to the cranks. The command "crank motors" is given with two long blasts of the whistle, or circles described in front of the body with the right hand. As soon as the motor is running the assistant driver takes his seat with the driver, and the command "forward" is given with one long blast of the whistle, or the arm raised and lowered vertically from the shoulder several times. The command "halt" is given by means of one long blast of the whistle, or the arm extending horizontally. When the commanding officer of the convoy gives the arm signal "halt" the assistant driver of each vehicle stands down on the step or running board, facing the commanding officer, and extends his arm horizontally so the signal may be relayed from vehicle to vehicle. To slow down, the same arm signal as for halt is used, except that the arm is moved up and down in a small arc.

After the convoy has been halted and each vehicle has taken its proper interval for the halt, the signal to stop motors may be given verbally, or by two short and one long blast on the whistle, or with the arms crossed in front of the body at the waist and moved sharply to the sides.

File-Closer. The last vehicle of the convoy should carry tools, ropes, jacks, etc., which are necessary to effect simple road repairs. This vehicle should be in charge of the mechanic or some other experienced man who acts as file-closer and will have the assistant mechanics as near him as possible, on the other vehicles, available to act under his orders. His duties are to assist any disabled vehicles and to make proper disposition of broken down vehicles, subject to the orders of the commanding officer. The file-closer must not leave any vehicle of the convoy without taking the proper measures either to repair the vehicle on the road, tow it along with the convoy, or dispose of it subject to the decision of the convoy commander. This repair truck should not ordinarily stop longer than twenty minutes before going ahead to rejoin the convoy. The light repair truck, if taken along, is placed in the convoy according to the judgment of the convoy commander and will be at his disposal and in charge of a mechanic.

Night Operations. In operating convoys at night, especially in the forward areas of the theatre of operations, where it is necessary to travel without lights, both speed and intervals should be reduced, and frequent halts made to see that the trucks are keeping up. If a truck becomes disabled on the road it must be dropped out of the convoy to avoid delaying the vehicles behind it, but at the next stop, space should be left in the convoy so that it may take its proper place if it catches up before the convoy moves again. Such a vehicle returning to the convoy should not be permitted to move up to its place in the column unless authorized by the officer in command.

The commanding officer of a motor convoy is not only responsible for the conduct of the convoy on the road, but must look out for the welfare of his transportation. According to motor transport regulations, therefore, he is perfectly justified in refusing to place his trucks on ground which in his judgment would injure or endanger them when loading or unloading, and he does not permit his trucks to run over soft ground. He instructs his drivers to keep at least two wheels on hard going all the time.

Loading. Motor transportation must be loaded efficiently, as well as operated efficiently. Every minute a truck is idle is so much loss, and every mile that a truck is operating with less than a full capacity load represents a loss; therefore, in dispatching trucks, they should be loaded to capacity and have if possible, a return load provided to avoid an empty haul. The time of loading and unloading should be reduced to the minimum, and trucks should be parked in such a way that the least possible time is lost and the least distance traveled between the park and the zone of work. Whenever possible, a truck should be selected for the kind of work it has to do. Do not use two vehicles when one will do the work. For example, if you have a three ton load and a three ton truck, it is better to send the three ton load out on the three ton truck than to send two 1½ ton trucks to carry the three ton load.

Length of Vehicles. These factors influence the allotment of road space.

Class "A" Trucks (1½ ton)	18 ft. 6 in.
Class "AA" Trucks (¾ ton)	17 ft. 3 in.
Motor Ambulances (AA chassis)	16 ft. 9 in.
Dodge Touring Car	13 feet
Animal-drawn Ambulance and 4-line team.	32 feet
Escort Wagon and 4-line team	32 feet
300-gal. Tank Trailer with draw bar	13 feet
Kitchen Trailer with draw bar	16 feet
Spare parts Trailer with draw bar........	11 ft. 6 in.
Wheel litter Carrier with draw bar........	7 ft. 6 in.
Motorcycle (with or without side car) ...	8 feet

CHAPTER XXIV

CARE, RIDING, AND DRIVING, OF ANIMALS

Introduction. In this age of mechanization the driving of animals and perhaps to a lesser extent horsemanship, is gradually becoming a lost art. With our units in the field mounts and animal drawn vehicles are used. The latter include especially the escort wagon (Fig. 177) and the animal drawn ambulance, (Fig. 13), both normally drawn by four mules. In the exigencies of field service enlisted men may be required unexpectedly to assume a mounted status or to drive a team. Therefore in all medical detachments and other units employing mounts and animal drawn transportation the personnel should receive some instruction on this subject. While the art of riding and driving can be taught only practically, considerable useful knowledge may be acquired from careful reading of the basic principles. Familiarity with the parts of the saddle, bridle, harness, etc., the methods of handling and using them, and the general rules for the care of animals, are essential.

The terms driver, teamster, or wagoner may be used interchangeably, as they have the same meaning.

Food for Animals. In the Army, animals foods are divided into two general classes—hay and grain.

A good food for a working animal should contain constituents in such proportions that the greatest possible percentage of nourishment can be extracted from it and a sufficient amount of bulk can be consumed to satisfy all requirements—namely, maintain the body temperature, appease the appetite, and produce the required work without upsetting the digestion or occasioning loss of flesh. As no one food will answer all demands, the ration should be arranged so that its several components will do so in the aggregate. Such foods are usually described as "well balanced." From a well-balanced ration the animal can extract the largest possible amount of nutriment, though from no food, however suitable, is it possible for the total quantity of its value to be absorbed by digestion. The following, while possibly slightly excessive in grain, are suggested as samples of a well-balanced ration for an average horse doing average work:

1. 6 pounds of oats.
   4 pounds of corn.
   2 pounds of wheat bran.
   4 pounds of alfalfa hay.
   10 pounds of wheat straw.
2. 12 pounds of oats.
   4 pounds of alfalfa hay.
   10 pounds of timothy hay.
   (For draft or artillery animals.)

3. 10 pounds of oats.
   2 pounds of wheat bran.
   14 pounds of timothy hay.

4. 10 pounds of oats.
   2 pounds of wheat bran.
   14 pounds of prairie hay.

When animals begin to gnaw the woodwork and eat dirt and dung, the cause may be looked for in the lack of mineral matter in the food or in the insufficiency of hay in the ration. An animal can not subsist on a diet of grain alone and the necessity for supplying a certain bulk to the ration can not be too much emphasized. In the field, when hay can not be obtained, grazing should always be resorted to at every opportunity. The quality of the grass is not relatively of great importance. It is highly necessary, however, that as "roughage" it should be sufficient in bulk to properly distend the intestines. Failing grass, the animal should be permitted to consume any form of roughage, such as straw, bark, leaves, etc., with which his appetite can be tempted.

Fig. 177.—"Old Reliable". The Army Escort Wagon and Mules.

Principles of Feeding. From the anatomy of the animal and from the physiology of digestion several rules regarding feeding are deduced.

Water one hour or more before feeding.
Feed in small quantities and often.
Do not work hard after a full feed of grain.
Feed hay before grain, or feed chop or chaff with grain.

Water before feeding. This is the established custom in the Army. The reason for its adoption is that animals drink very rapidly in large gulps and the water runs quickly through the gullet, stomach, and small bowels into the water gut. If the ear is placed against the side of an animal drinking, the rushing of the water can be heard. Such a stream passing through an already full stomach would wash a considerable portion of the contents with it into the bowel, and, if the meal is only just finished, they would not be sufficiently mixed with the gastic juice. As a consequence their digestion would be incomplete. This means an avoidable loss of nourishment and, perhaps, indigestion and colic.

It must not be imagined, however, that "water before feeding" means "do not give any water till the next meal." The stomach is, as a matter of fact, never really empty. Some food usually remains in it but, within an hour of feeding, water may be given if desired. When water is left constantly with the animal, it will be found that a sip or two is frequently taken, but not a long draught.

A working animal, especially if tired and hot, will naturally swallow an inordinate quantity of water very rapidly and the common-sense application of this rule is to allow him the opportunity of quenching his thirst before giving him a dry grain feed.

Feed in small quantities and often. The digestive apparatus of the horse or mule is arranged to admit of leisurely feeding for many hours at a stretch. The stomach is small and can not contain large quantities at a time. There is no gall bladder to store up the bile, which flows constantly from the liver directly into the bowel, but the capacious bowels are capable of accommodating a large quantity of food during slow digestion. The bulk of the food then does not stay long in the stomach but, once the stomach is about two-thirds full, passes through at the rate that it is taken into the mouth, until feeding is finished.

An animal out at pasture spends most of his time eating, steadily grazing by the hour. The only variations he allows himself are an occasional short gallop with others, a brief and infrequent visit to the stream, and a few hours rest. But the working horse and mule receive at stated intervals a large amount of very stimulating and palatable food which they learn to eat very rapidly. The stomach works best when it is about two-thirds full. If these periodical feeds, which require a good deal of digestion, are too large, there is danger of the animal overdistending the stomach and so incurring the risk of indigestion. A feed of 3 or 4 pounds of oats, mixed with a couple of handfuls of chaff, represents, when chewed and mixed with saliva, the amount which the average animal is capable of consuming to the best advantage at a meal. This may be followed by a long and slow consumption of hay, but the gradual passage of the food into the bowel takes place under favorable conditions. If the feed is much larger, it causes a distention of the elastic stomach and a corresponding weakening of its digestive power. Should this overloading be very excessive, the stomach is stretched to such an extent as to be incapable of effort, the food soon ferments, gas is given off from it, and acute indigestion, which may lead to rupture of the stomach, ensues. If, then, an animal is to be given a larger quantity of grain than usual, it is not wise to increase the size of each feed, but to give the extra quantity as an additional meal. This plan of increasing the number instead of the quantity of feeds is more particularly to be recommended for the conditioning of thin animals, since their digestion, as well as their muscles, is weak and unable to cope with much at a time.

Do not work immediately after a full feed. Immediately after a full feed the stomach and bowels are actually bigger than before, they contain more water and food and are perhaps slightly distended by gases resulting from the digestive process. Consequently, they occupy more room than was the case just previous to feeding. The extra room is provided by a little filling out of the belly generally and also (and this is the important point) by the bulging forward of the stomach against the diaphragm. On the other side of the diaphragm lie the lungs. Any pressure on them impedes their power of expansion and it is for this reason that strong work immediately after a full meal causes instant blowing and distress. The lungs can not expand and contract with sufficient facility to get rid of their combined blood and provide the amount of fresh air necessary for it, and labored breathing is the result. If hard work is persisted in under these conditions either the lungs get choked with blood or the digestion stops. The latter is most serious, rupture of the stomach as a result of gaseous distention being not uncommon. Heavy draft or fast work should therefore be avoided directly after a full meal, but no harm results from continuing a quiet journey.

Feed hay before grain, or feed chop or chaff with grain. Feeding hay before grain, or feeding chop or chaff with grain, is done to cause the animal to eat his grain more slowly, masticate it more thoroughly, and as a consequence receive from it the maximum nutrition. Each method is beneficial. One or the other should be habitually used, or both may be employed if little or none of the hay is used for bedding.

Each organization commander knows his own animals and sees that they are kept in proper flesh by judicious regulation of their feed. Some animals will need more, others less, and, by feeding them according to the requirements of the individual, good results will be obtained.

Feeding on the March. Feeding on the march in peace and war are very different matters. In peace, whether at home or abroad, there is a certainty of receiving sufficient rations at stated intervals, and practically no thought is required from officer or man in connection with their provision. But in war the conditions are entirely changed and demand special attention, for while a mounted soldier's chief asset is his animal it is also the most difficult to keep in working order in campaign. For a man accustomed throughout his life to the care of animals, more particularly in a new or uncivilized country, it is a matter of simple routine to provide for his animal's wants at every possible opportunity, as it becomes automatic for him to think of his animal. But the average soldier has not had such training and experience, and unless it is thoroughly drilled into him that he must think of and for his animal on all occasions, the latter is apt to suffer.

It is in the matter of hay that the difficulty of providing sufficient animal rations is likely to be felt oftenest. Grain may be supplied with regularity, but hay or other filler is very bulky and its punctual issue can not be relied upon. Every mounted man should be made fully aware of his duty to his animal in this respect.

Subject to the property rights of individuals, the following procedure should be observed in campaign; Standing crops of all descriptions provide excellent filler and should not be passed without the animal being fed, while, if circumstances permit, a sufficient quantity should be carried to provide for the next halt. Opportunities for grazing may occur. When halted the animal will not fail to avail himself of them if the man allows him. Visits to farmhouses may offer the chance to replenish empty nose bags, and these should be kept full, no matter what the contents, so long as they are eatable. Of course, in campaign the niceties of method which we rightly adopt during peace can not always be adhered to, and some risks must be taken. Unless time and food are equally important, and this is not very often the case, the latter should be eaten whenever opportunity occurs, even with prospect of immediate severe work. It is better under the circumstances that some cases of colic and perhaps death from ruptured stomach be risked than the chance of a feed be missed, a chance which perhaps may not recur for many hours. In this connection it is well to bear in mind that exhaustion has a temporary depressing effect on digestion. If the animals are very tired and the day very hot, it is not a good plan to feed unless sufficient time can be taken to water and rest the animals before feeding. If time will permit, it is better to water the animals, if water is available, and allow them to rest with loosened equipment than to attach a stuffy feed bag to interfere with breathing. Under such circumstances many animals will not attempt to eat but simply endeavor to rid themselves of the encumbrance. The practice of feeding exhausted animals when there is not sufficient time invites colic.

On the march the principle of feeding little and often should be adopted. At every halt of sufficient duration the nose bag should be put on. When marching long distances the portability of food becomes a serious question and compressed rations of various descriptions are likely to be used. Of whatever materials these consist, they should be well broken up and if possible mixed with any procurable hay which will give them bulk—that is, chaff, chopped straw, or grass. Just previous to feeding, they should be well dampened if they are very dusty. Meal of any description and even meat may be used. The addition of a very few ounces of sugar to a limited ration is a great help in sustaining animals engaged on a prolonged effort.

While such articles may help in an emergency, horses can not maintain condition without sufficient *bulk* of food and constant effort must be made to provide hay of any description, in addition to grain rations.

During peace, in all marches of over five hours it is advisable to feed once *en route;* if possible, soon after the animals have had a good drink. The bit being removed, the nose bag is buckled up, to allow the animal to reach the feed easily and prevent him tossing his head and spilling the grain. Halfway through the feed it may be necessary to readjust it for the same reason. Animals that toss their heads persistently should have the top of the bag tightened round the face by a rubber, cord, or strap to prevent waste. When the animal ceases to feed he should be allowed to graze. Any grain remaining in the nose bag should be saved. Great care should be taken to secure the mouths of all nose bags so that the contents may not be spilled on the way.

Watering. *Quantity Required.* According to the temperature and work they do, animals require anywhere from 5 to 15 gallons of water a day, a fair average quantity being 8. Hot weather and hard work, or both combined, will nearly double ordinary requirements, and in making any calculation of the amount required these factors must be considered.

Quality of Water. Animals are said to prefer soft water, but it is not a point of much practical importance, for most stabled animals are given hard water and thrive on it. The best horse-breeding districts are those of a limestone foundation, where a great deal of the water is hard. It should in any case be fresh, pure, well aerated, and free from waste, smell, and color.

Periods of Watering. The structure of the animal's bowels is adapted for taking in large quantities of water at comparatively infrequent intervals. Three times daily may be counted an average number. In cool weather and when not at work animals will themselves drink only twice daily, but under such conditions they will get a good deal of moisture from their grazing. At work, especially when weather is warm, four times daily should be the rule. Water should be given previous to feeding.

Animals should not be watered for at least an hour after feeding, but they may be allowed to drink freely while at work, even though sweating. If brought in hot they may be given a few swallows at intervals, but should be kept moving until they have cooled down.

Care should be taken not to allow too many animals to water at once, only such number as there is plenty of room for being taken to the water. They should be allowed ample time to drink their fill and not be led away the first time they raise their heads from the water. This must be carefully explained to the untrained man who thinks because an animal puts his head up to get his wind after his first fill that he has finished. Animals should be led to and from water at a walk and if possible not more than two animals per man. Restless and kicking animals should be watered separately.

Watering on the March. Animals should be watered within reason whenever opportunity occurs, especially on hot days. There is little risk attached to their being allowed to drink frequently. The usual method of watering before feeding will of course be adhered to, but if a stream is crossed an hour after feeding they may be again allowed to drink if circumstances permit the delay. Bits, especially the curb, should be removed when it is intended to give a full watering.

When water is scarce its issue must be carefully regulated to avoid any waste. Animals can drink from a very shallow vessel if their bridles are removed. Taking advantage of this fact, small quantities may be poured into a shallow receptacle, the supply being regulated by the animal's rate of swallowing. A very small quantity will revive overtaxed animals, and it should be given in repeated little rations rather than one long draft. When the amount is very scanty, say a pint or less, it is best to offer the exact quantity to each in turn rather than to risk a large bucketful, as the first comers are sure to get an undue proportion and may upset it in their eagerness. On one occasion during a campaign, animals received no water for 55 hours and 20 of them for 70 hours. On another occassion when much exhausted and 35 miles from water, less than 1 pint per animal was available. This was mixed with meal into a number of soft balls, which revived them, and they accomplished the remainder of the journey the next morning. In regard to this particular point it must be noted that thirst is better endured in hot climates by animals which are natives to them, a fact which should be remembered when selecting animals for arduous duties. When marching, public watering troughs should be avoided, owing to the risk of contagious disease being introduced.

While watering, overcrowding of the animals should be prevented and plenty of time should be allowed for every animal to drink his fill. Groups of animals should come up together and leave together. If they are moved away individually, others will cease drinking and try to follow them. Animals frequently raise their heads while drinking to restore their interrupted breathing. Accordingly, great care must be exercised not to move them before their thirst is fully satisfied. However, after they have finished drinking, animals are inclined to paw up the water and even lie down. Hence, unless there is method, care, and close supervision in watering large commands, the first units to arrive will render the water wholly unfit for those coming afterwards.

If practicable, the place for the noon halt should be 2 or 3 miles beyond a convenient watering place. The animals should be watered and then moved forward to the designated resting place. At the day's destination, however, it is best to first relieve the animals of the weight of their equipment. They will in the meantime have become cool and rested, after which they should be watered before feeding.

Grooming. The objects of grooming are cleanliness, prevention of disease, and improvement in condition and appearance.

Cleanliness. The coat of an animal at work and left ungroomed becomes matted and crusted with dandruff, sweat, and dirt. To this accumulation are added the urine and manure of the stalls when the the animal lies down. If this filth is not removed, the skin underneath becomes irritated and forms a ready soil, if infected, for the rapid spread of disease such as mange, and infestation by lice. These conditions become at times the scourge of armies.

Prevention of Disease. In view of the foregoing, it should be taught that upon grooming mainly depends immunity from mange and lice and that, in the field as well as in garrison, officers should permit no service demands or trying weather conditions to prevent utilizing the necessary time and labor involved in one good daily grooming for their animals.

Improvement in Condition and Appearance. Extra grooming, especially massage of any variety, has a great effect in improving the general condition and is a point which has always received the greatest attention from those who train animals for any form of service and prolonged exertion. It must be borne in mind that all working animals are kept under purely artificial conditions. They receive an amount of food which is far in excess of their bodily requirements and which is converted into the extra energy which enables them to produce the work required, whereas in a natural state they eat no more than sustains them, take little more exercise than enables them to change pasture, and only carry their body weight. The extra food consumed and work done produce greater and more rapid changes throughout the body than would otherwise result. The digestion is called on to perform much more work in the same time and the blood has an increased quantity of nourishment poured into it. At the same time the work, which is rendered possible by the increased nourishment, creates a large amount of extra waste, which is got rid of by the lungs breathing more rapidly, the kidneys and bowels working at increased pressure, and the skin throwing off more material in the sweat and dandruff. The amount got rid of by the skin is very considerable and increases enormously when exertion is severe and sustained, so that it is essential that the skin should be in as good condition and as well trained as the rest of the body. Grooming, therefore, is one of the means which help to make the body fit as well as clean.

Grooming Kit. The grooming kit consists of the currycomb, with hoof hook, horse brush, and grooming cloth, sometimes augmented by the dandy brush and wisp.

Drying Hot Animals. Sweating animals should be blanketed and walked about until cool, being given a few swallows of water from time to time, then rubbed, and wisped until dry. Returning animals from work wet with sweat may be avoided by allowing them to walk the last mile or so before reaching the stable.

Sweaty areas under the saddle should be dried as soon as the saddle is removed, or a covering should be left on the back until cool.

"Breaking out"—that is, sweating in patches—is occasionally observed after drying or grooming in hot weather. The patches should be again dried, and if they recur the animal may be lightly covered and led out in the open for a while. The condition occurs most frequently in animals which are not fit, but some animals constantly exhibit it.

Cleaning the Sheath. In warm climates during certain seasons of the year the presence of screw worms and maggots resulting from the attacks of flies makes close attention to the sheath necessary. Occasionally the sheath becomes very foul from accumulated secretions and dirt and requires cleaning. In some animals a thick cheesy substance accumulates at the end of the penis on either side of the urethra. It forms the so-called "bean" and may interfere with urinating. Cleaning should be accomplished by first removing very carefully any accumulated material and then washing with warm water and castile soap. The finger nails are liable to injure the soft tissues and should therefore be cut short and made smooth prior to the cleaning operation.

Causes of Casualties Among Animals. In the field the majority of casualties among animals come under the following headings:

1. Contagious diseases.
2. Loss or want of condition, and exhaustion.
3. Colic.
4. Wounds and injuries.

Loss or want of condition, combined with injuries, usually account for the bulk of the losses. These may be regarded as preventable. Communicable diseases are also to an extent preventable. Their spread in any case may be greatly checked by simple precautions. The best means of prevention, generally speaking, is a thorough knowledge of the management of animals in health. While the animal is fit and in condition, hardship and exertion can be borne without injury, but the unconditioned animal soon becomes unfitted because of injury or disease. He then becomes an encumbrance. It is on this account that so much stress is laid on the necessity for thorough knowledge of stable management, feeding, and work, under all conditions, and on the importance of the prevention of injuries rather than on their treatment. Sufficient knowledge to deal with injuries and emergency cases in a common-sense manner, until professional assistance is obtainable, is an excellent addition to the mounted soldier's education. However, these occurrences will be comparatively few and far between, if the animals are got and kept thoroughly fit. It must be borne in mind that when veterinary assistance is obtainable it must be sought.

General Rules for the Care of Animals. Animals require gentle treatment. Docile but bold animals are apt to retaliate upon those who abuse them, while persistent kindness often reclaims vicious animals.

Before entering an animal's stall and when coming up behind him, speak to him gently, then approach quietly.

Never kick an animal, strike him about the head, or otherwise abuse him.

Never punish an animal, except at the time he commits an offense, and then only in the proper manner, never in anger.

Give an animal an opportunity to drink before leaving the stable or picket line and before putting the bit in his mouth.

Never take a rapid gait until the animal has been warmed and circulation in the feet started by gentle exercise.

When an animal is brought to a stable or picket line in a heated condition, never allow him to stand uncovered. Put a blanket on him and rub his legs or walk him until he is cool. If he is wet, put him under shelter, not in a draft, and rub him with a wisp until dry.

Never feed grain or fresh grass to an animal when heated. Hay will not hurt an animal, however heated he may be.

Never water an animal when heated, unless the exercise or march is to be immediately resumed. Sponging out the mouth and nostrils is refreshing to the heated animal and will not hurt him.

Never allow an animal's back to be cooled suddenly. To cool the backs of riding animals gradually, remove the pack and equipment from the saddle, loosen the girth, remove the blanket, replace it with the dry side next to the animal, and replace the saddle, girthing it loosely. With pack animals remove the load and later the pack saddle or aparejo.

Never put an animal up for the night until he is thoroughly cooled off and clean, especially around the legs, pasterns and feet.

Individual men returning from mounted duty or pass should report their return to the stable sergeant, who should inspect each animal and see that it is properly cared for.

Never mount or ride an animal in a stable.

How to Fold Saddle Blanket. The blanket, after being well shaken out, should be folded into six thicknesses, as follows:

Hold it up by two corners, so that the long edge of the blanket is up and down.

Double it lengthwise (so the fold will come between the "U" and "S"), the folded corner between the thumb and forefinger of the right hand, thumb pointing to the left.

Slip the left hand down the folded edge two-thirds its length and seize it with the thumb and second finger.

Raise the hands to the height of the shoulders, the blanket extended between them.

Bring the hands together, the double fold falling outward.

Pass the folded corner from the right hand into the left hand, between the thumb and forefinger.

Slip the second finger of the right hand between the folds and seize the double folded corners.

Turn the left (disengaged) corner in and seize it with the thumb and forefinger of the right hand, the second finger of the right hand stretching and evening the folds.

After evening the folds grasp the corners and shake the blanket well in order to smooth the folds.

Raise the blanket and place it between the chin and breast.

Slip the hands half way down the blanket, the first two fingers outside, the other fingers and thumb of each hand inside.

Seize the blanket with the thumbs and first two fingers of each hand and let the part under the chin fall forward.

Hold the blanket up, arms extended, and even the lower edges.

Seize the middle points of the blanket between the thumb and forefinger of each hand and flirt the outside part over the right arm.

Hold the blanket thus, until ready to place it on the horse.

(The preceding is a description of the normal method of folding the saddle blanket. Departure from this method may be resorted to however, with the view to preventing undue wear on the bearing surfaces and along the folded edges of the blanket, and, on occasion, for the relief or prevention of sorebacks. Recruits should be given careful instruction in the various methods practised in the service by which the above objects are accomplished.)

The blanket should, if possible, be kept dry and free from sand, caked dandruff, and hairs. It should be frequently shaken out and well switched, if necessary, to restore its pliability and remove dust and hair. In warm weather, when the animal sweats freely, a fresh, clean bearing surface on the blanket should be placed next to the back.

It is not a good plan to dry the sweat-soaked surface of a folded blanket in the sun and put this dried surface next the back the following morning. Such drying hardens the dandruff mixed with sweat and dust that is always present, and makes this part of the blanket rough and hard. It is preferable to double the sweat-soaked folded blanket on itself, so it will remain moist and soft.

How to Put on Blanket. Approach the horse on the near (left) side, with the blanket folded and held as just described.

Place the blanket well forward on the horse's back by tossing the part of the blanket over the right arm to the off (right) side of the horse, still keeping hold of the middle points.

Slide the blanket once or twice from front to rear to smooth the hair on the horse's back, being careful to raise the blanket in bringing it forward.

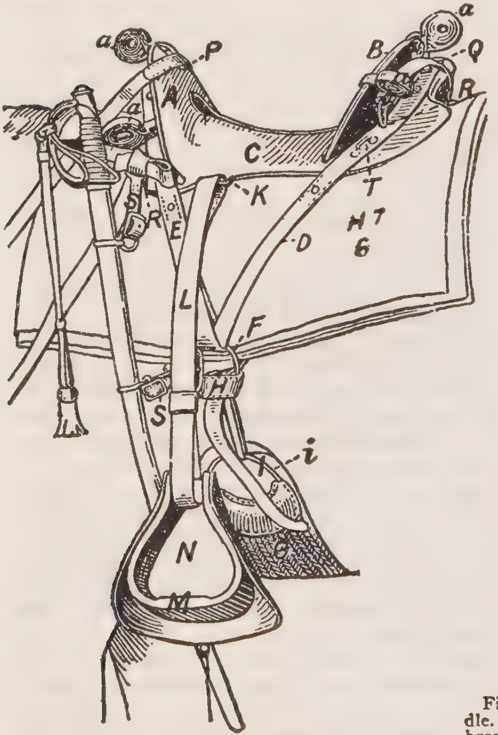


Fig. 178.—Nomenclature of Saddle. A, Pommel; B, Cantle; C, side bar; D,E, spider (quarter straps); F, spider (or girth-strap) ring; G, cincha; H, cincha strap; I, cincha ring; i, cincha-ring safe; K, stirrup loop; L, stirrup strap; M, stirrup tread; N, stirrup hood; P, shield; Q, stud; R,R, rings; S,S, saber straps; T, staple; a,a,a,a, coat straps.

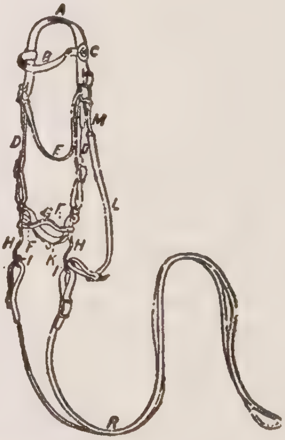


Fig. 179.—Nomenclature of Bridle. Headstall: A, Crown-Piece; B, brow band; C, ornament; D,D, cheek piece; E, throatlatch. Bit: F,F, mouth piece; G, port; H,H, branches; I,I, rein rings; K, curb strap; R, reins Link: L, link stap; M, link snap.

Place the blanket with the forefinger of the left hand on the withers and the forefinger of the right hand on the loin.

The blanket should now be well forward with the edges on the left side.

Smooth the blanket and remove the locks of mane that may be under it.

How to Saddle. (McClellan Saddle). The stirrups should be crossed over the seat, the right one uppermost; the cincha and cincha strap crossed above the stirrups, the strap uppermost.

The blanket having been placed on the horse as previously explained, seize the pommel of the saddle with the left hand and the cantle with the right.

Approach the horse on the near side from the direction of the croup and place the center of the saddle on the middle of the horse's back, the front end of the side bar about three finger widths behind the point of the shoulder blade.

Let down the cincha strap and cincha.

Pass to the off side, adjust the cincha and strap, and see that the blanket is smooth.

Return to the near side and raise the blanket slightly under the pommel arch so that the withers may not be compressed.

Take the cincha strap in the right hand and reach under the horse and seize the cincha ring with the left hand.

Pass the end of the strap through the ring from underneath (from inside to outside), then up and through the upper ring from the outside; if necessary, make another fold in the same manner.

Cincha Strap. The cincha strap is fastened as follows:

Pass the end through the upper ring to the front and seize it with the left hand.

Place the fingers of the right hand between the outside of the strap and, pulling from the horse with the right hand, take up the slack with the left hand.

Cross the strap over the folds and, with the right hand, pass the end of it underneath and through the upper ring back of the folds, then down and under the loop that crosses the folds and draw it tight.

Weave the end into the folds of the cincha strap.

Another method of fastening the cincha strap is as follows:

Pass the end through the upper ring to the rear and seize it with the right hand.

Place the fingers of the left hand between the outer folds of the strap.

Pull from the horse with the left hand and take up the slack with the right hand.

Pass the end of the strap underneath and draw it through the upper ring until a loop is formed.

Double the loose end of the strap, push it through the loop and draw the loop taut. The free end of the strap should be long enough to be seized conveniently with the hand.

The cincha strap when first adjusted should admit a finger between it and the horse's belly. After exercising the horse for a while the cincha should be examined; if too loose it should be readjusted.

Having fastened the cincha strap, let down the right stirrup, then the left.

The surcingle is then buckled over the saddle, and should be a little looser than the cincha.

Breast Straps. A breast strap is not usually required. When used it should be so fitted that the upper edge of the rosette, or ring, is three finger-breadths above the sharp breast bone. The breast strap should admit the breadth of the hand between it and the flat of the shoulder.

Quarter Straps. After placing the saddle in the middle of the horse's back, the quarter strap ring should be pushed forward and fixed by the sliding loops so that when tightened the cinch will be over the sternum of the horse and not over his floating ribs. If the sliding loops become loose, it will be well to fix the quarter strap ring in place by the use of a short thong or by putting a rivet through the quarter strap in rear of the quarter strap ring.

The quarter strap should be adjusted to such a length that the quarter strap ring is over the lower edge of the blanket. The buckle of the quarter strap should be against the cantle halter square.

Stirrup Straps. The stirrup strap should be put on the saddle so that the hair side of the leather encircles the stirrup loop on saddle and the spreader of the stirrup. This leaves the flesh side of the leather out. The buckle of the stirrup strap should be inside, and at the front of the stirrup, and against it, so that under no circumstances can it touch the gun boot, the blanket, or the saber.

Greatest care should be taken in the fitting of a saddle; sore backs are generally occasioned by neglect, and men must never be allowed to lounge or sit unevenly in their saddles.

How to Unsaddle. (McClellan Saddle). Stand on the near side of the horse and unbuckle and remove the surcingle.

Cross the left stirrup over the saddle and loosen the cincha strap and let down the cincha.

Pass to the off side and cross the right stirrup, then the cincha.

Pass to the near side and cross the cincha strap over the saddle.

Grasp the pommel with the left hand, the cantle with the right hand, and removing the saddle over the croup, place it in rear of the horse, pommel to the front.

Grasp the blanket at the withers with the left hand and at the loin with the right hand.

Remove it in the direction of the croup, the edge falling together, the wet side in.

Place the blanket on the saddle, the folded edge on the pommel.

If unsaddling in the stable place the saddle on its peg when taken off the horse.

On arriving in camp and having dismounted, ease off the cincha about 3 inches and change the bearing of the saddle by moving it to rear or front at least an inch. Allow the saddle to remain on the back for ten or twelve minutes, to enable the almost bloodless skin beneath (caused by weight of yourself and pack) and the tired saddle bed muscles to regain to some extent their lost tone, while you busy yourself about the bridle and halter, and the religious duty of closely examining the feet for loose shoes, rocks, nails, bruises, thrush, and interfering sores. Now remove the saddle, turn over the blanket, and let that remain in place until the back has dried.

If any dry spots are noticed on the sweaty skin while the blanket is being turned over, remember they are inflammations of the skin, produced by unequal distribution of weight, and are liable to puff up later if not attended to. Mark their location well, for you are close to the walking stage if you neglect them. When the back is dry, remove the blanket and take care of it. Massage well from front to rear the spots referred to, bathe the saddle bed with clean water, dry it, and let the animal roll if he will. Should small swellings appear, however, keep the blanket in place until a soaking wet gunny sack is produced. Now remove the blanket, massage the swelling vigorously, and put the wet folded gunny sack pack over the back and secure it there with a surcingle snugly drawn. Do not allow the animal to roll if it can be avoided, and keep the pack wet during the night. In the majority of cases the animal will be ready for careful saddling in the morning.

Should you have produced a gall, the place should be bathed and disinfected with "White Lotion," or with creolin or carbolic-acid solution (1 ounce to the quart of water), the spot protected from flies, cold-packed if necessary, and the animal led until nature effects a cure. Close attention to cleanliness, disinfection, and stimulation of the wound will hasten the process.

Even with very close attention to saddling, galls may be produced if the rider is not a careful one.

Irrespective of the fit of the saddle and condition of the blanket, the things that cause galls and "bunches" most frequently are carelessness in balancing and securing the pack, a lounging, shifting seat, and a sloppy method of handling the reins, inattention to proper cinching, unequal length of stirrups, neglect of adjustment at the halts, the riding of a lame animal, and the galloping of a leg-weary one.

How to Put On Bridle. Take the reins in the right hand, the crownpiece in the left hand.

Approach the horse on the near side, passing the right hand along his neck.

Slip the reins over the horse's head and let them rest on his neck.

Take the crownpiece in the right hand and the snaffle bit in the left hand.

Bring the crownpiece in front of and slightly below its proper position.

Insert the thumb into the side of the horse's mouth, above the tush, and press upon the lower jaw so as to cause him to open his mouth.

Insert the bit by raising the crownpiece and, with the left hand, quietly draw the ears under the crownpiece and arrange the forelock.

Secure the throatlatch.

The bridle should be adjusted so that the curb bit will touch lightly the upper corners of the lips, and so that the throatlatch will admit four fingerbreadths between it and the throat.

A *noseband,* when used, should be two fingerbreadths below the cheek bone and should admit two fingerbreadths between it and the nose.

With a snaffle bridle, its use assists in the easy control of the horse.

How to Take Off Bridle. Stand on the near side of the horse and pass the reins over the horse's head, placing them on the bend of the left arm.

Unbuckle the throatlatch.

Grasp the crownpiece with the right hand and, assisting with the left hand, quietly disengage the ears.

Lower the crownpiece with the right hand and gently remove the bit from the horse's mouth with the left hand.

Place the crownpiece in the palm of the left hand and, taking the reins in the right hand, pass them over the crownpiece.

The bridle is placed across the saddle on the blanket.

If unsaddling in the stable, the bridle is hung on its peg by the crownpiece.

If the horse is not equipped with a halter, unbridle and push the bridle back so that the crownpiece will rest on the neck behind the poll. The horse may be held thus, until a halter is put on, after which the bridle should be removed.

How to Adjust Length of Stirrup Straps. To approximate the correct length of stirrup straps, before mounting, they are adjusted so that the length of the stirrup strap, including the stirrup, is about one inch less than the length of the arm, the fingers extended.

How to Mount. Take position on the near side of the horse, facing and opposite the girth; with the aid of the left hand take both reins in the right, forefinger between the reins, and place the right hand on the pommel, the reins coming into the hand on the side of the forefinger, and held so as to feel lightly on the horse's mouth, the bight falling on the off side. Then place a third of the left foot in the stirrup, with the assistance of the left hand if necessary, and support it against the forearm of the horse; rest upon the ball of the right foot, grasp a lock of mane with the left hand, the lock coming out between the thumb and forefinger.

To *mount,* spring from the right foot, holding firmly to the mane and keeping the right hand on the pommel; pass the right leg, knee bent, over the croup of the horse without touching him; sit down in the saddle; let go the mane, insert the right foot in the stirrup, pass the reins into the left hand and adjust them.

Position of Mounted Soldier, or Attention Mounted. The following is a description of the position of the mounted soldier, or attention, mounted:

The buttocks should be pushed well forward underneath the body and bear equally upon the middle of the saddle. The buttocks must not press against the cantle.

The thighs should extend downward and slightly forward. They should rest without constraint upon their flat sides and clasp the horse evenly.

The knees should be bent, but without stiffness, and should clasp the horse snugly.

The lower legs should extend downward and slightly backward; they should be in contact with the horse, but without pressure.

The ball of the foot should rest easily on the tread of the stirrup, the heel slightly lower than the toe, the ankle without stiffness.

If the rider is without stirrups, the feet should hang naturally; they should be free from stiffness in the ankles.

The upper part of the body should be easy, free, and erect.

The spine should curve backward in the region of the loins, and thence extend directly upward. The entire spinal column should be supple, especially in the small of the back.

The shoulders should be thrown back evenly, but without hollowing or stiffening the back.

The arms should be free, the elbows falling naturally by the side.

The reins should be held in the left hand.

The head should be erect, but without stiffness in the neck.

The eyes should not be downcast, but alert and glancing well to the front.

The position described above is regarded as the best seat for the military horseman. It is easy and comfortable to both man and horse, a consideration of the highest importance in the prevention of sore backs. It permits the efficient use of the aids in the control of the horse, upon which, on occasion, may depend the soldier's life. It is a solid and secure seat, from which the soldier is not easily thrown under trying circumstances, and due to which he is able to ride boldly to the attack and to use his weapons with the greatest effect in a mounted fight.

The position given is a model to which a well-formed man whose body is aptly proportioned for riding can quickly conform. Others, whose legs are round and short, or whose bodies are square and thick-set, can only be expected to adjust themselves as far as possible to the normal position without rendering themselves too uncomfortable or causing themselves undue fatigue or pain. Moreover, many men have become excellent riders whose positions are not, and could not be, absolutely according to the model. Often such men possess other and more than compensating qualities as horsemen. All men, however, no matter what their natural aptitudes or degrees of proficiency, are greatly improved in their riding by conscientious efforts to conform to the model position described.

The Aids in Horsemanship. The training of a horse involves the infliction of more or less pain, the necessity for which becomes less as his intelligence is quickened into understanding the lightest pressure.

A horse is *bit-wise* when (the bit being correctly fitted and properly adjusted,) he obeys the lightest pressure upon either bar.

He is *rein-wise* when he obeys the lightest pressure of the rein on either side of the neck, the bit not being disturbed from its normal position.

He is *leg-wise* when he obeys the lightest correctly combined action of the rider's legs.

The most thoughtful care should be constantly exercised in the combined applications of the aids, that they may not be opposed to each other in their action, *i. e.,* one favoring the intended move, the other opposing it.

The reins and legs, the application of which determines the movements and gaits of the horse, are called the *aids.*

The rider should not only know when to apply a given aid, but he should also understand why he applies it.

The reins serve to prepare the horse to move, and to guide, support, and halt him; their action should be gradual and in harmony with that of the legs.

In using them the arms should have free action at the shoulder; when a light pressure will be sufficient to govern the horse, the action of the hand should be at the wrist; for greater pressure, the elbow should be carried back, *but without raising the hand.*

In riding, the bridle hand should be kept steady and ought not to move with the body; it should merely oscillate with the motion of the horse's head; at the same time it must be kept light, for the bit causes pain if pressed constantly on the mouth, destroys its sensibility, and makes the horse's mouth hard.

The hand is light when there is an almost imperceptible alternate feeling and easing of the hand in harmony with the motion of the horse, by which the delicacy of the mouth is preserved, and the horse made to carry himself lightly.

That hand is best which, by giving and taking properly and keeping constant touch of the bit, controls the horse with the least force, and will best preserve the mouth.

The legs serve to assist, together with the reins, in controlling the horse. Closing the knees, without pressure by the lower part of the leg, tends to steady the horse in position. Carrying the lower legs slightly to the rear, closing them equally with slight pressure, prepares him to move, or, if moving, to keep him up to the hand. Closed with greater pressure behind the girth, they urge him forward.

Carrying right (or left) leg to the rear, closing it with pressure, causes the horse to move his haunches to the left (or right).

The pressure of the legs must be an elastic muscular action, suited to the sensitiveness of the horse; a heavy, clinging pressure or dull thumping with the heels must not be permitted.

The reins act to direct the forehand; the lower legs incite to action and govern the movement of the haunches.

All changes of gait are made gradually. The horse should never be spurred to make a sudden start, nor should the reins be jerked.

Care of Vehicles. The proper care of vehicles not only requires daily examination and repair in the field but attention to many other details.

Upon return of troops from field duty the transportation should be immediately overhauled, thoroughly repaired, and necessary accessories replaced.

At each inspection of the transportation, required repairs should be noted and assigned to individuals whose duty it is to make them.

When on field duty the transportation must be carefully examined at the end of each day's march to see that the spokes of wheels and nuts on axles and bolts are tight, and to arrange for proper repairs of vehicles and harness, including the replacement of broken or lost spare parts.

Tail gates and chains must not be allowed to hang down or drag.

In garrison, or in camp where there is a probability of movement by rail, blocks for securing vehicles on freight cars and a ramp for unloading vehicles and animals should be prepared and kept on hand.

Vehicles should be greased twice a week regularly and as often in addition as may be found necessary. If in constant use, wagons will require daily greasing. In greasing, the old grease, dirt, and sand should be removed and not allowed to accumulate. The axle is usually raised for greasing by use of a jack. Should it be necessary to grease a heavy vehicle without use of a jack, the nut is first removed. The nuts on the right hand are right-handed and those on the left are left-handed. A board or stick, slightly longer than the distance from the axle to the ground, is secured and placed with one end on the ground, and inside the wheel, the other end leaning toward the wheel; the upper end is placed under the spoke which is about horizontal. The wheel is then raised slightly by lifting carefully on the spoke on the opposite side, when, if it has been sufficiently greased, the weight of the vehicle will cause the wheel to slide down the spindle. It should not be allowed to slide more than three-fourths of the way off, but should be taken off far enough to scrape off the grease. This method can not be used if the axles have not been properly greased. To put the wheel on, the procedure should be reversed, placing the stick on the outside. The wheel will not run on as easily as it did off, but with the stick inclined and a slight pressure of the wheel it will go on. The nearer the upper end of the stick is placed to the hub the less power will be required to lift the wheel off the ground.

In garrison, wagons should be kept under cover whenever practicable. Mud should not be allowed to accumulate on vehicles. Facilities should be made available to permit their being washed off at the end of the day's work.

All vehicles in use should be painted at least once a year.

Arrangement and Care of Harness. In garrison, when the harness is not in use it should be conveniently arranged on pegs on the heel posts of stalls, and, if practicable, should be sacked to keep off the dust, or it should be placed on proper supports in a harness room.

In the field, when the harness is not in use and no other shelter has been provided it should ordinarily be kept in the wagon bed.

When removed from the animals at night the collars should be carefully wiped off and dust removed from the remainder as far as practicable. The harness should never be thrown on the ground where it will get muddy and dirty, for where the mud hardens and rubs against the animal's skin sores will result. Collars should be buckled when removed from animals.

Before using a new harness it should be wiped clean and a light coat of oil applied.

Harness should be cleaned once a week and whenever it gets muddy, and the leather work kept soft and pliable. It should be oiled once a month after cleaning; oftener, if necessary.

To clean and oil black leather harness take the harness completely apart, unbuckling straps, and removing buckles, loops, etc., wherever possible. The equipment to be used is a bucket of lukewarm water, sponge, harness soap, harness dressing, neat's-foot oil, and lampblack. Hot water must never be used or the leather allowed to soak in any water. A rack should be provided on which to hang the harness. When no better arrangement is available one end of the wagon pole can be inserted between the spokes of one of the hind wheels, above the hub, and strapped to the axle. A set of harness can then be hung on the pole, the sponge moistened in clean water, and passed over the harness until the dirt becomes soft. The sponge should be rinsed as often as necessary and the dirty water replaced frequently with clean water. A good lather is then obtained by rubbing the sponge on the harness soap and the harness is given a good heavy coating of this lather, the rubbing being continued until all the dirt is removed. In some instances it may be necessary to use a thin piece of wood to scrape off the dirt.

When the harness is thoroughly clean, the leather parts are well coated with a thick lather and allowed to dry, after which it is rubbed clean.

When the harness has not been cleaned for some time and is hard, it should be cleaned as above described. Afterwards, for each single set of harness to be cleaned, a pint of neat's-foot oil is poured into a pan, mixed with lampblack in the proportion of 1 teaspoonful to each pint of oil, and stirred until it has a glossy black appearance. In cold weather the oil should be heated until it is lukewarm, but never hot, before using on harness. The mixture is applied with a small sponge, rubbing it in well. About 48 hours should elapse before using harness again. In cold weather the harness, after being thus oiled, should be allowed to hang in a warm room for an hour. It must be dried gradually; never close to a hot fire or stove or in the hot sun.

In cleaning and oiling fair leather harness the procedure is the same, omitting the use of lampblack and such soap as tends to blacken the leather.

A buckle must not be worn in the same hole all the time, but should be shifted a hole or so occasionally, as this precaution will prevent the leather from rotting in that place.

The harness should be examined at each inspection of transportation and each driver should examine that of his own team every day upon completion of work. The necessary repairs should be made without delay. No alterations should be permitted.

The Wagoner (Driver, Teamster). The wagoner must have a thorough knowledge of—

The adjustment of the harness, driving, and the methods of receiving, stowing, and caring for cargo, and of securing loads on wagons.

The nomenclature of vehicles, harness, spare parts, and accessories, and where they are carried on the vehicle.

How to groom, water, feed, and care for animals.

How to clean and care for vehicles, harness, and equipment.

How to harness and unharness.

How to hitch and unhitch.

How to lash loads.

He must be skilled in the practical performance of all of the above-mentioned duties and ready to perform any other that may be required by proper authority. He must be resourceful and able to cope with unusual situations, depending upon his own initiative for results.

He is responsible for his team, harness, and wagon, with tools and spare parts, and the condition in which he keeps them is a measure of his efficiency. A successful wagoner is one who keeps his wagon and animals in good condition and gets his load to its destination at the proper time.

He must look over the feet of the animals of his team each morning and evening, clean them out, and note if the shoes are loose. It is a good idea to tap the shoes with a knife handle or hammer. If the animal flinches there is usually something wrong.

He should be familiar with the individual characteristics of the animals which make up his team. In referring to draft mules, two are called a pair, the one on the left side is called the "near" mule and the other the "off" mule. The pair assigned to the traction of a single vehicle are termed, collectively, "a team," those in front being called the lead pair or leaders, those attached directly to the vehicle the wheel pair or wheelers.

Routine Duties of Wagoner. It is a good plan to have a fixed time for every routine duty, as then there will be no chance of overlooking anything. Certain duties should be attended to daily and others weekly.

The following is suggested as a daily program to be followed: Immediately after arising in the morning the wagoner should feed grain to his team, brush off, harness them, and examine their feet. After the wagoner has had breakfast the ground where the animals have stood during the night should be policed. The wagoner should then water, hitch up the team, and report to the location ordered. At every opportunity enroute the animals should be watered from a running stream or from a bucket, but never from a public trough unless same has been pronounced sanitary by competent authority. Upon reaching camp or bivouac the wagon should be parked in the place designated, the harness removed and hung up, and the sweat and dirt wiped off collars, bellybands, and cruppers. The animals should be watered and tied to the picket line, their feet carefully cleaned out and examined, and note taken of loose or missing shoes. A special examination should be made to ascertain whether any abrasions or enlargements have developed. The animals should then be groomed, their shoulders washed, and the harness so adjusted that on the next day's march the pressure may be removed from any swollen parts which may have formed. The animals should then be fed grain and hay. After reporting any animals requiring shoeing or veterinary attention the wagoner should wash and get his meal. A thorough examination should be made of the harness as well as nuts on the wagon, minor repairs made immediately, and those requiring special attention reported to a specialist. The wagon should then be greased if necessary.

How to Prevent and Care for Bunches. Careful fitting, adjusting, and cleaning of harness and equipment and care in use of the lines and brake, particularly at the time of starting heavy loads, will prevent bunches. Prompt attention will prevent bunches from becoming large. It is much easier to prevent them than to eradicate those already formed.

Padding should never be placed over a bunch, as it only makes the bunch worse. If felt collar pads are not obtainable, pieces of sheepskin with thongs attached are very handy for use in case of sore shoulders or collar boils. They are tied one on each side of the affected part and should be large enough to cover the entire half of the collar except the sore spot. Small pieces would only cause undue pressure on the spots covered by them. If felt collar pads are available, the padding should be removed from them so as to relieve pressure from the bunch.

How to Put On, Adjust, and Take Off Halter. The wagoner folds or coils the halter shank or rope, takes the halter and shank in the left hand, and approaches the animal just in front of the near shoulder. He places the halter under the animal's neck, grasps the crownpiece with the right hand over the neck, slides it forward with the right hand, and extends the noseband forward with the left hand until it is in position; the halter is then raised by the use of both hands until the noseband is in position around the animal's nose. The halter is then buckled sufficiently tight to prevent its slipping off, but not so tight as to interfere with breathing and comfort. As soon as the crownpiece is buckled its end is passed through the keeper. A sufficient number of holes should be punched in the crownpiece to permit of its proper adjustment.

How to Put On, Adjust, and Take Off Bridle. To put on the bridle the wagoner takes the reins in the right hand and the crownpiece in the left hand, approaches the animal on the near side, slips the reins over its head, and lets them rest on the neck. He then takes the crownpiece in the right hand and places it in front and just a little below its proper position. With the bit lying in the palm of the left hand, which is held under the animal's jaw, the thumb is inserted into the side of the mouth above the tush. The wagoner presses open the lower jaw and inserts the bit by raising the crownpiece. With the left hand the ears are gently drawn under the crownpiece beginning with the left ear, after which the throatlatch is secured. The throatlatch should be loose enough to permit easy breathing and tight enough to hold the bridle securely on the animal's head. The cheekstraps should be adjusted so that the bit is well up in the corners of the mouth but does not wrinkle it.

To unbridle, the wagoner passes the reins over the animal's head, places them on the bend of the left arm, unbuckles the throatlatch, grasps the crownpiece with the right hand, and gently disengages the ears. He removes the bit by lowering the crownpiece. The bridle is hung on the left hame by one of the bit rings or by the crownpiece.

How to Put on Harness. *Ambulance or Escort Wagon Wheel Harness.* The wagoner first takes the breeching off the harness peg, thus releasing the collar, which he places over his left arm, top down. He slips his right arm through the breeching and backband, grasps the off hame with his right hand at about the center and the near hame with his left hand also at the center, walks to the near side of the animal, and gently places the harness on its back. He now puts on the collar and adjusts the hames upon it. He pulls the breeching into place, the bellyband through the loop in the end of the choke-strap, buckles it, snaps the side straps into the choke strap ring, and puts on the bridle.

Ambulance or Escort Wagon Lead Harness. The wagoner proceeds as with the wheel harness except that he places, adjusts, and secures the crupper in lieu of the breeching.

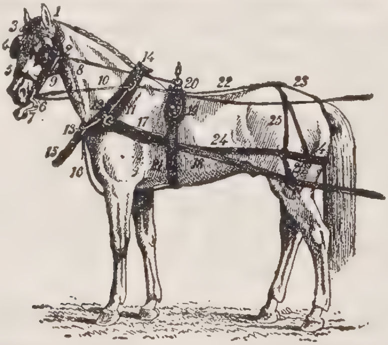


Fig. 180.—Nomenclature of Harness. 1, Crown; 2, cheek piece; 3, front; 4,4, blinds; 5, nose band; 6, bit; 7, curb; 8, check; 9, throatlatch; 10 rein; 11, collar; 12 hame; 13, hame link; 14, hame strap; 15, pole strap; 16, martingale; 17, trace-tug; 18, trace; 19, saddle; 20, terret; 21, belly-band 22, turn-back; 23, crupper; 24, breeching; 25, hip-strap; 26, trace bearer.

How to Adjust Harness. *The Collar.* A collar should be selected which, when buckled, will fit so that there is just room to pass the hand between the collar and throat at the bottom. It should not be so narrow that it will pinch the animal's neck or so wide that the bearing surface will come on the outer part of the shoulder. The top of the collar should be so fitted as to follow the contour of the crest and conform to the animal's neck. If the collar is too short it will choke the animal, if too long or too wide it will cause abrasions on the point of the shoulder. The collar should be moist when first used so that it will shape itself to the animal's shoulders and neck by the pressure of draft. This moisture is most effectively given by wrapping it in wet sacks and leaving them on for one night before it is used. Collar pads are useful with large collars when proper sizes can not be obtained.

The Hames. The hames should be adjusted in length by shifting the upper straps to the proper holes. The length should be such that the point of the attachment of the trace will be opposite the middle of the surface of the shoulder over which the collar rests. This is for the purpose of distributing the pressure evenly over the shoulder and thus reducing it to the minimum at any particular point. In adjusting hames the straps should not be so tight as to squeeze the collar. The upper hame strap should be just long enough to be taut when the lower strap is buckled snugly.

The Traces. The traces should be adjusted to the larger animal of the pair. All 4 traces of the pair should be of equal length. The traces are hooked long enough so that the singletrees will not interfere with the movement of the animals, the wheel traces so adjusted as to allow at least 14 inches between the hind quarters and the singletree when in draft.

Breast Strap. The breast strap should be so adjusted that it will not be tight or leave too much slack to properly guide the pole. This strap is not intended to hold back the load.

Breeching. The turnback strap should be so adjusted that the ring in the end will be even with the point of the hips, and the hip straps should be adjusted so that the breeching will hang squarely around the buttocks. The breeching should not hang too low, as this has a tendency to pull the animal's feet from under him and reduce his backing power when backing a load. The side straps should be adjusted so that there is no strain upon the breeching other than when backing the vehicle and so that they do not have an unnecessary amount of slack at other times.

Lines. The spread lines are passed through the rings on the spreader straps and adjusted so that the animals will be squarely in front of their own singletrees. If the spread lines are too short they will draw the animals' heads together; if too long they will allow their heads to spread them apart.

Backband. The backband is adjusted so that there will be no slack above the traces, and so that there will be no downward strain upon it from the traces when the animal is in draft.

Bellyband. The bellyband should be buckled sufficiently tight to hold the harness in position but loose enough to permit of the traces straightening, without bringing a strain upon it.

The Crupper. The turnback should be adjusted so that the crupper will not pull on the animal's tail or be allowed to hang down from its proper position. The hip straps should be adjusted to such length that there will be no strain upon them when the animal is in draft, and sufficiently short to have no unnecessary or unsightly slack.

In adjustment of the various parts of the harness care should be taken to the end that straps are not twisted, causing the buckles to be turned in toward the skin of the animal, producing irritation and abrasions.

How to Unharness. *Ambulance or Escort Wagon Harness.* The wagoner unbridles, unfastens the side straps from the choke strap ring, unbuckles the bellyband and slips it out of the choke strap loop, unbuckles the lower hames strap, raises the hames, places them in rear of the collar, unbuckles the collar, and places it over the right arm. He then slides the harness over the animal's croup, passes the right arm through the breeching and backband and grasps the right hame with the right hand about the center, and the left hame with the left hand about the center in a similar manner as when harnessing. He then hangs the hames on the harness peg by the upper hames strap, allows the collar to fall from the arm down over the turnback strap, and hangs the breeching on the harness peg. Lead harness is taken off in a similar manner except that the crupper is hung on the harness peg in lieu of the breeching.

How to Hitch Team. *A Team Consisting of Two Pairs.*

First Method. The animals being harnessed and in their stalls, the wagoner backs out the wheel team and snaps the breast strap of the near wheeler into the bit ring of the off wheeler. He then backs the lead team out of its stall into position in front of the wheelers, snaps the spread line from the near leader into the bit ring of the off leader, hitches the near trace of the near leader into the bit ring of the near wheeler, and takes the team out to position in front of the wagon by leading the near leader. Upon arriving in front of the vehicle tongue he fastens the other lead spread line and takes down the near leader's line, which he holds in one hand, releases the trace from the near wheeler's bit ring, backs the wheeler into place, passes the near lead line through the ring on near wheeler's rein strap and places it over the near wheeler's back, fastens the spread lines on the wheelers, snapping them in the bit ring of the opposite animal.

He then passes the breast straps through the rings of the pole chains and snaps them into opposite hame rings and takes down the near wheeler's line. He steps behind the near wheeler and hooks the near trace on the off wheeler, off trace on near wheeler, near trace on near wheeler, passes the lines over to the off side of wheelers, hooks near trace on near leader, off trace on near leader, near trace on off leader, off trace on off leader, takes down off leader's line and passes it through the ring on off wheeler's rein strap, takes down the line on off wheeler and hooks off trace on off wheeler, all in order named, after which he gathers up the lines and mounts to the seat.

Second Method. The animals being harnessed and in their stalls, the wagoner enters the stall on near side of near wheeler, unties and passes in front of it, unties off animal and standing at their heads, between and facing them, grasps both bridle reins near the bit, right hand holding near animal and left hand holding off animal, and backs them out of their stall.

He then releases the outside rein and leading them walks between them, causing them to turn so that the near animal will be on the off side. He then brings out the lead team in like manner, places each in rear of its wheeler, and ties it by its halter shank to its wheeler's backstrap.

He then takes the team to the vehicle by leading the wheelers, approaches the vehicle from the front, stopping at the front end of the pole and causes the wheelers to turn in alongside of it.

He then snaps the inside line of near wheeler to off wheeler and the inside line of off wheeler to near wheeler, takes down the breast straps and fastens them through the pole chain rings and attaches them to opposite hame rings, steps to off side and takes down off wheeler's line, hooks the off trace, passes around head of the team, takes down near wheeler's line, steps behind near animal, hooks inside trace of off animal and inside and outside trace of near animal, unties near leader and then off leader and leads them to position in front of the wheelers, attaches spread lines, takes down near leader's line, passes it through the ring on near wheeler's rein strap, and places it on the near wheeler's back, hooks inside trace of off leader, inside and outside trace of near leader, takes up lines of the two wheelers and near leader and passes them over to the off side of the wheelers, takes down off leader's line, passes it through the ring on off wheeler's rein strap and places it with the other lines. He then hooks the off leader's off trace, gathers up the lines, and mounts to the seat.

Either of the above methods may be used, the first being the most expeditious with animals which are docile and will stand quietly. The second method is preferable for animals which will not stand quietly. Either method when used with untrained or nervous animals will require the assistance of one or more men to hold each pair while the wagoner hitches them.

A Team Consisting of A Single Pair. The wagoner backs the pair from their stall, and leading them, passes between them so as to have the off animal on the near side, takes them to the vehicle by leading one animal in each hand, approaches it from the front and leads them to a point opposite the middle of the tongue, one being on each side of it, turns them about and into position, fastens the spread lines and breast straps, takes down line on near animal and tosses it over to the off side of off animal, hooks near trace on near animal, passes around in front of the pair, takes down line on off animal, hooks off trace on near animal, near trace on off animal, off trace on off animal, gathers up the lines, and mounts to seat. One man can ordinarily hitch a single pair without assistance, but with untrained or nervous animals it may be necessary for an assistant to stand in front of the pair until the hitching is completed.

How to Unhitch Team. *A Team Consisting of Two Pairs.*

First Method. The wagoner unhooks the off trace on off wheeler, near trace on off wheeler, off trace on near wheeler, does up line on off wheeler, unhooks off trace on off leader, near trace on off leader, off trace on near leader, does up line on off leader, unsnaps line from bit ring on near leader, does up line on near leader, unhooks near trace on near leader, unhooks breast straps on wheelers, snapping breast strap of near wheeler into bit ring of off wheeler, unsnaps spread lines on wheelers, does up line on near wheeler, unhooks near trace on near wheeler, and hooks trace from near leader into bit ring of near wheeler. He then takes the team to the stable by leading the near leader. He unhooks the trace from the bit ring of near leader, unsnaps spread line from the bit ring of the off leader and leads the lead pair into its stall, after which he unsnaps the breast straps from the bit ring of the off wheeler and leads the wheel pair into its stall.

Second Method. This differs from the first method in that all traces and the breast straps are unhooked before any of the lines are done up. The leaders are tied to the wheelers on their side by means of attaching the halter shank to the back strap, and the team is taken to the stable by leading the wheelers.

Either of the above methods may be used, the first being the most expeditious with animals which are docile and will stand quietly. The second method is preferable for animals which will not stand quietly. Either method when used with untrained or nervous animals will require the assistance of one or more men to hold each pair while the wagoner unhitches them.

To Unhitch a Single Pair. The wagoner unhooks off trace on off animal, near trace on off animal, off trace on near animal, and does up line on off animal. He then passes in front of the pair, unhooks near trace on near animal, does up line on near animal, unfastens pole straps, and unsnaps the spread line. He then unsnaps the outside lines from the bit rings and leads the pair to its stall.

How to Drive Team. The wagoner should sit comfortably in his seat, body erect, without stiffness, elbows close to the sides. He should not lean forward, half stand, or slouch back in his seat, because in these positions a falling or shying animal may pull him off his seat. The driving gloves should be large and comfortable. The hands should be held close together in front of the center of the body, knuckles to the front, forearms nearly horizontal.

In driving with the left hand, the right hand is used only for shortening the reins, assisting the left hand in stopping the team and for using the whip. The left wrist should be slightly bent to the rear. This gives a more flexible contact with the animal's mouth than if the wrist is straight and rigid. The lines should never be shortened by elevating the left hand, which disturbs the seat. The right hand should be used to assist in shortening them.

To hold the lines the wagoner brings the line on the near wheeler under the little finger of his left hand up through the palm of his hand and over his thumb. He passes the line on the near leader between the little finger and the one next to it up through the palm of his hand and over his thumb. He brings the line from the off wheeler between the second and third fingers of the right hand and down inside the third and little fingers. He brings the line from the off leader between the first and second fingers of the right hand and down inside with the other line.

To hold all lines in one hand the wagoner passes the lead line from the right hand over the top of the first finger of left hand and the wheel line from the right hand over the top of the second finger of left hand, and turns both lines down inside the left hand.

In starting the team with a heavy load or in any situation where it is necessary to get the united power of the animals the lines should be held fairly tight, so that the animals may be made to feel the aid and guidance of the driver. The unremitting attention of every driver is required in order that each animal of his team shall at all times do its proper share of the work. In starting, all traces should be stretched before the team moves. A common fault is to start one pair before the others are in draft, the tendency of which is to make the animals balky, fatigue them by jerks, gall their shoulders, and break the harness.

While en route the lines should be sufficiently tight to prevent their becoming entangled or an animal passing his tail over one of them, to give each animal the feeling of being on the hand, and to maintain pairs abreast of each other. In reducing the gait, halting, and backing, the pull on the lines should be gradual and used in conjunction with the voice and brake.

In turning to the right, the off lead and wheel reins should be grasped in front of the left hand by placing the middle and little fingers of the right hand over them. These reins should then be shortened by pulling on them, or the near reins lengthened by allowing the left hand to move slightly to the front. In turning to the left, the near lead and wheel reins should be handled in the same manner. In stopping, all four reins are shortened by pulling them through from behind, or the right hand may be placed over the reins in front of the left and the weight used to assist.

In crossing ruts or turning sharp corners, the leaders should be out of draft; otherwise the pole may be snapped off or the wheelers pulled down.

Before arriving at the crest of a hill the team should be steadied for the descent, and with just enough traction from the leaders to prevent their singletrees hitting them. If a wheeler slips in descending the hill, especially if near the bottom, he should not be pulled up, but the team should be allowed to go a little faster.

In no case should the lines be used to accelerate the pace or gait, and the wagoner should never be permitted to "milk" the lines.

Jerking the lines should never be tolerated other than to stop a team which is running away.

A Few Hints. Always keep a steady pressure on the reins.

Never remove left hand from reins, even though the right may be holding them in front, as it is very difficult to get the left hand back into its place again with the reins in the right places.

Lead reins should seldom be removed from left hand.

Grip the reins tightly with the third and little fingers to prevent their slipping.

Alter position of the bits if the team pulls hard.

Should the team be getting the better of you, and you find that you can not stop it, it will be found a great assistance to place the right leg over all the reins, as you may be able to stop them by the extra power and leverage by the position of the leg. Of course, it is understood the brake has been applied.

Do not get into the habit of "'jabbing" the animals with the bits, and do not flap the reins on their backs to start them or make them increase their pace.

Drive at a steady, even pace, as nothing tires a team so much as to constantly change the rate of speed.

When it is necessary to pull up in a hurry, the proper course to pursue is to catch hold of the reins with the finger and thumb of the right hand, just beyond the left, and shorten them as much as necessary by pulling them through. This is safer and more business-like than elevating the hands, which disturbs the seat.

The right hand is known as the whip hand. It is generally used only for holding the whip, for assisting the left hand, and for shortening the reins by pulling them through from behind the rein hand.

In starting feel all the animals' mouths, and, if necessary, give them the word to go, dropping the hand to them at once until the vehicle is fairly off. The wheelers ought to start the wagon, and this can be effected by touching them with the whip, if they require a hint. It is never safe to start without having the whip in the right hand, ready for immediate use. The whip is to the driver what the leg is to the rider, that is, it keeps the team up to their bits. As soon as the team is going straight, take the right hand off the reins, at the same time keeping it close by, ready for any emergency.

How to Use Whip. To use the whip, the wagoner passes the lines to his left hand, holding the whip by the butt end of the stock and the end of the lash between his forefinger and thumb. With a backward swing of the arm he releases the end of the lash, allowing it to swing back in a circular motion, and with a forward stroke the lash is brought down upon the desired animal.

The whip is used only for slow or lazy animals and in a hard pull, in which case a slight cracking of it is preferable and usually sufficient.

Use of the whip should be limited to necessity, and unnecessary cracking of whips should be prohibited.

The wheelers should be hit in front of the saddles, to avoid making them kick. It is no use hitting the wheelers if the leaders' reins are too long. In this case you must first shorten up the wheelers' reins, and then use the whip on the leaders; otherwise, as soon as the wheelers have jumped into their collars, the leaders will again press forward and allow the wheelers to hang back as before.

The proper hitting of the leaders with the whip can only be acquired by constant practice when off the wagon. A good whip can hit his leaders wherever he desires and without the dangerous, flail-like swipes that some teamsters appear to consider necessary.

How to Use Brake. To put on the brake, the lever is pushed forward either with the hand or foot, and is held by the ratchet. To take off the brake, the catch is released from the ratchet and the lever pulled back. The brake is used in going downhill, in crossing ditches, to stop the wagon at a halt, and to hold it while the team is at a standstill. It should be used to hold the wagon at halts while ascending slopes. If a team starts to run away, the brake should be used to help stop it.

How to Load Wagon. Animal-drawn vehicles should not be overloaded, as doing so will result in injury to them and to the harness and animals. The standard load of 3,000 pounds for the escort wagon includes 235 pounds for weight of the driver, his equipment, and the grain carried for the team, and this load should not be exceeded except in cases of extreme emergency. In such cases a full report and explanation should be made to the commanding officer by the person responsible for the overloading. The standard load for the spring wagon is 1,000 pounds.

In loading, heavy articles should be placed in the bottom of wagon bed and in front, with lighter articles in rear and on top so as to have the weight of the load near the bottom and in the forward third of the wagon bed. Articles should be placed so that there is no vacant space between them, in order to prevent their shifting. Articles which may be required en route should be so placed in the load as to be always accessible. The tail gate should not be lowered to carry a larger load, as this not only makes the load too heavy in the rear but will be almost certain to split the side of the bed outward, there being nothing left to support its rear end. The bows should be pushed well down into their staples and should not be raised to provide greater loading space. The cover is then placed on the bows and tied down to the rings on the side of the bed. Its ends are drawn together by a rope, the ends of which are then crossed and made fast to rings on the opposite sides of the wagon bed.

When wagons are loaded the loads should be securely lashed with the escort wagon lash rope before the cover is put on. The manner in which the rope is used depends on the nature of the load. Ordinary loads are lashed by securing an end of the rope around one end of the front crossbar and lacing the rope from side to side over the load, using the lash cleats provided on the sides of the wagon bed for engaging the rope. The rope should be drawn tight and passed around one end of the rear crossbar; after which it is carried forward along the sides of the load by passing it around the first (rear) loop that goes over the load, and taking all slack out by pulling it to the rear; after which it is carried to the next loop and so on until the forward loop is reached, to which it is attached by two or more half hitches, after all slack has been taken out.

How to Get Out Stalled Wagon. In pulling heavy loads, or on heavy ground if there is any liability of the team stopping, the wagoner should stop the animals before they get stalled. Many animals will not pull again on a load in the same place where they have met with resistance which has impressed them as insurmountable. If the team should get stuck, it may be induced to try again by turning the tongue slightly to the right or left and then getting all off together, straightening the pole as the pull is commenced.

If the wheels are sunk, the earth in front of them should be removed by using the spade, prior to attempting to start, and if the wagon is in a very difficult position time will usually be gained by attaching additional animals, making use of the snatch block and fall, or unloading the wagon.

What to Do If Wagon Upsets. Should a wagon upset, the cover, bows, and lash rope are removed, after which it is unloaded, placed upright on good ground, and then reloaded.

Rates of Travel for A. D. Vehicles. The rates of travel of animal-drawn transportation vary with the nature of the vehicle, the size of the load, the class and condition of the animals employed, condition of the roads and weather, and length of the column. Passenger-carrying vehicles can be driven at the rate of 7 miles per hour for 3 or 4 hours under favorable conditions. Should the distance be great and animal-drawn transportation necessarily employed, arrangements should be made to change the animals every 15 miles, by placing them in relays. Heavily loaded vehicles can maintain the slow rate of march prescribed for infantry, under favorable conditions.

Road Rules for A. D. Vehicles. The rules in common use by drivers of private vehicles, no matter whether in the United States or foreign countries, must be strictly adhered to by drivers of all Government vehicles. Halts should always be made at one side of the road, leaving a clear passage. In the United States, Hawaii, Panama, and Porto Rico the rule will be followed of passing on the right and overtaking on the left. On a hill, all teams coming up have the right of way over those going down. In case of a breakdown the vehicle must be immediately removed so as not to obstruct traffic.

On a narrow road a loaded team has the right of way, and it should be given ungrudgingly.

On overtaking a vehicle, pull out to the left and pass it at a steady pace and without cracking your whip or coming in too close.

When followed closely by another vehicle and both are at a good pace, signal with your whip if you are about to slacken your gait or change your direction.

When approaching a railroad crossing, bring your team to a walk; halt if necessary, but always look and listen.

Be courteous in observing the simple rules of the road; give plenty of room to others, and do not forget that a smile or a pleasant laugh will do more for you than a growl or a surly remark. Horsemen, as a rule, possess good dispositions; meet them at least half way.

General Rules for Stable Management. The following general rules are recommended:

The stable sergeant has immediate charge of the police and sanitary condition of the stable, picket line, etc., and is the custodian of the forage and stable property generally.

The stable is to be kept thoroughly policed, free from smells, and, except portions of stalls that animals can reach, should be well limewashed. There must be no accumulation of manure or foul litter inside, nor near the doors or windows without. The feed boxes are washed from time to time, and kept clean. The ground about the picket line is swept daily, and all dung, etc., carried to the manure heap.

Except at night, when the animals are bedded down, no manure or urine is to remain in the stalls; the stable police remove it as it accumulates.

If practicable, all woodwork within reach of the animals, and not protected with sheet iron or other metal, should be painted with thin coal tar to prevent it being gnawed. The same precaution may be followed with regard to troughs, picket posts, and picket line. It should be thoroughly dried before putting animals near it.

Smoking in stables, or in their immediate vicinity, is prohibited.

One or more lights will be hung in each stable to burn during the night.

Over each animal's stall is placed his name.

Clay is the best for earthen floors. Gravel, or sandy earth, is not suitable.

The sloping of the floor of stalls from the manger to the heel post is injurious and uncomfortable for the animal, making him stand in an unnatural position, with the forelegs higher than the hind ones. When the earthen floors are level, the animal will paw a hollow for his forefeet unless he can elevate his hind quarters by backing out of the stall.

Whenever animals go out of the stable, the windows of their stalls are to be kept open, unless necessary to exclude rain or snow, or when cold drafts affect the animals in contiguous or opposite stalls.

Stable doors are never closed in the daytime, except to keep out wet, or to exclude cold winds that blow on the animals. If the doors be in a single piece, bars are put across the doorway; if divided into upper and lower halves, it will usually be sufficient to open the upper part. At night, the entrance to the stables should be secured in such manner as will prevent the escape of animals.

When circumstances permit, horses and mules should be turned loose in the paddock during the daytime, or herded under charge of a guard. When neither is practicable, they should, except in very cold, windy weather, or in very hot weather where there is no shade, stand most of the day at the picket line, as they have better air and are less confined, while the stables become drier and more healthful.

In ordinary climates, stables must be kept as cool as possible. If the animals do not stand directly in the draft, the colder the stable the less will they suffer if called suddenly to take the field. For the same reason, animals should never be blanketed in the stable, except during very cold weather.

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NHMRL00222538